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Environmental Assessment

Richmond Transport

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GOLDEN GATE



NATIONAL RECREATION AREA • CALIFORNIA

ENVIRONMENTAL ASSESSMENT

ACTIVITIES PROPOSED BY
THE SAN FRANCISCO CLEAN WATER PROGRAM
FOR THE RICHMOND TRANSPORT COMBINED SEWER OVERFLOW PROJECT ON
LANDS OF THE GOLDEN GATE NATIONAL RECREATION AREA AND PRESIDIO OF
SAN FRANCISCO

SEPTEMBER, 1992

National Park Service
San Francisco, California

Region Four Office

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REPORT ON THE

INVESTIGATION

CONDUCTED BY

THE COMMISSIONER OF THE

THE PROSECUTOR GENERAL
IN THE MATTER OF
THE STATE OF NEW YORK

INVESTIGATION OF THE

PROSECUTOR GENERAL

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INTRODUCTION

The City and County of San Francisco has requested construction permits and permanent easements from the National Park Service, U.S. Army at the Presidio and the Veterans Administration Medical Center (VAMC) at Fort Miley for construction associated with the Richmond Transport combined sewer project¹, a portion of the City's Wastewater Master Plan. (See Figure 1).

The proposed project is required to comply with mandates of the California Regional Water Quality Control Board and the U.S. Environmental Protection Agency to reduce combined sewer overflows at/near Baker Beach and China Beach from 40 to 8 per year. The Richmond Transport will serve the Richmond and Sea Cliff neighborhoods and will benefit GGNRA lands and federal lands within the Presidio through improvements in water quality that will result from elimination of all overflows at Baker Beach and reduction of overflows at other outfalls.

The project would consist of the following:

1. Construction of a 10,200 foot long, 14 foot diameter wastewater tunnel beginning at the Great Highway near Sutro Heights Park, passing beneath Lands End and the Veterans Administration Medical Center, and ending in the Presidio near Lobos Creek
2. Construction of a 10 foot diameter wet weather pipe paralleling Lobos Creek.
3. Relocation of the overflow discharge point from Baker Beach to Mile Rock outfall which is located at Lands End near Fort Miley. (See Figure 2).

All improvements would be designed to meet federal and state standards for reducing the discharge of pollutants to the receiving waters.

This Environmental Assessment considers only those activities which would occur on federal properties under a special use permit and/or permanent easement.

The proposed activities on federal lands are:

1. Construction Staging. Temporary use of Presidio lands adjacent to Lobos Creek; temporary use of National Park Service lands south of Sutro Heights Park and at the Fort Miley parking lot as construction staging areas.

¹Combined sewer system- where storm and sanitary flow are combined into one collection system.

INTRODUCTION

The first objective of this study was to determine the relationship between the physical and chemical properties of the soil and the biological activity of the soil. The second objective was to determine the effect of the physical and chemical properties of the soil on the biological activity of the soil. The third objective was to determine the effect of the biological activity of the soil on the physical and chemical properties of the soil.

The physical properties of the soil were determined by measuring the bulk density, particle density, and porosity of the soil. The chemical properties of the soil were determined by measuring the pH, total nitrogen, and total phosphorus of the soil. The biological activity of the soil was determined by measuring the respiration rate of the soil.

The results of the study are presented in the following sections:

1. Description of the study area and the soil. The study area was located in the central part of the country. The soil was a brown forest soil. The climate was temperate.

2. Physical properties of the soil. The bulk density of the soil was 1.2 g/cm³. The particle density of the soil was 2.65 g/cm³. The porosity of the soil was 54%.

3. Chemical properties of the soil. The pH of the soil was 5.5. The total nitrogen of the soil was 0.15%. The total phosphorus of the soil was 0.05%.

4. Biological activity of the soil. The respiration rate of the soil was 0.5 g CO₂/m²/h.

5. Relationship between the physical and chemical properties of the soil and the biological activity of the soil. The results of the study showed that the physical and chemical properties of the soil had a significant effect on the biological activity of the soil.

The physical properties of the soil had a significant effect on the biological activity of the soil.

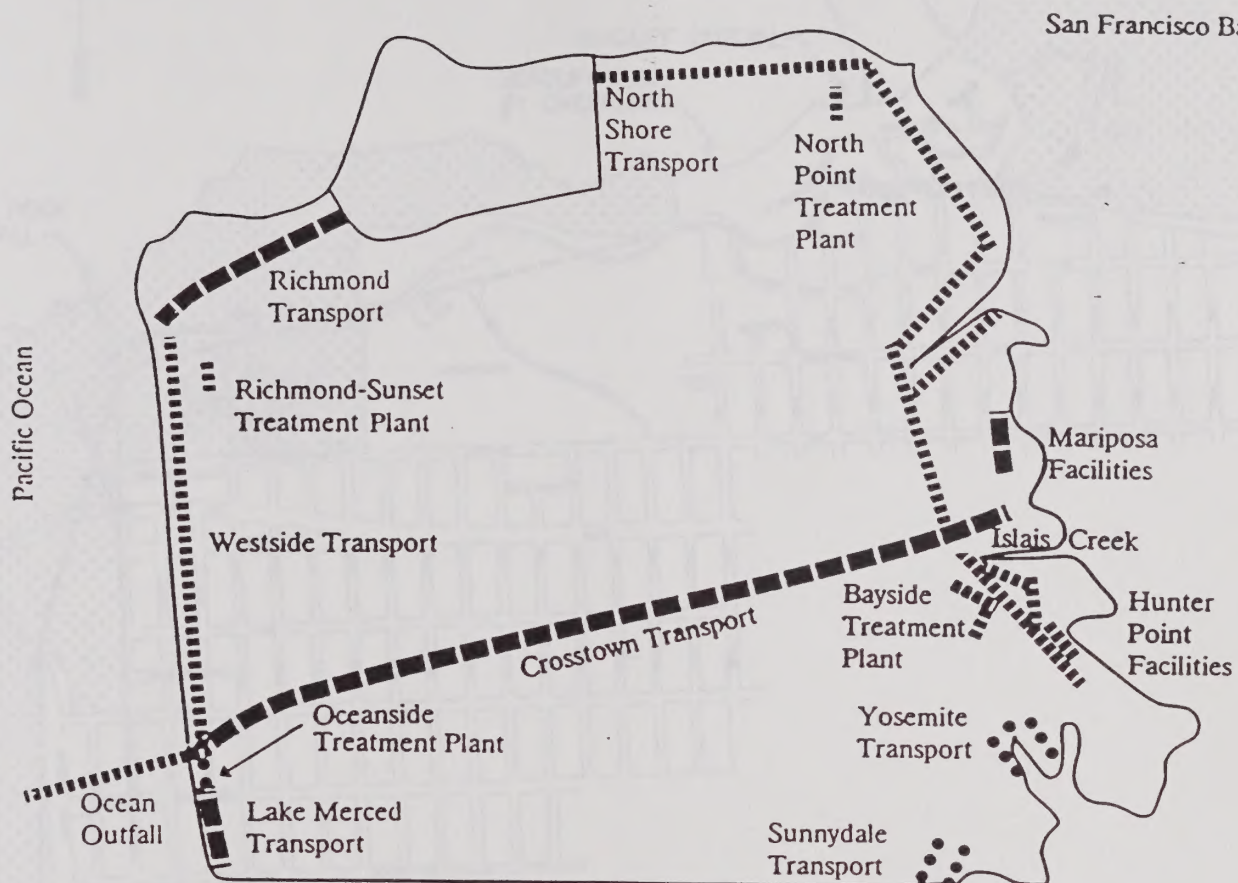
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The biological activity of the soil had a significant effect on the physical and chemical properties of the soil. The respiration rate of the soil had a significant effect on the physical and chemical properties of the soil.

WASTEWATER MASTER PLAN

Richmond Transport Project

FIGURE 1



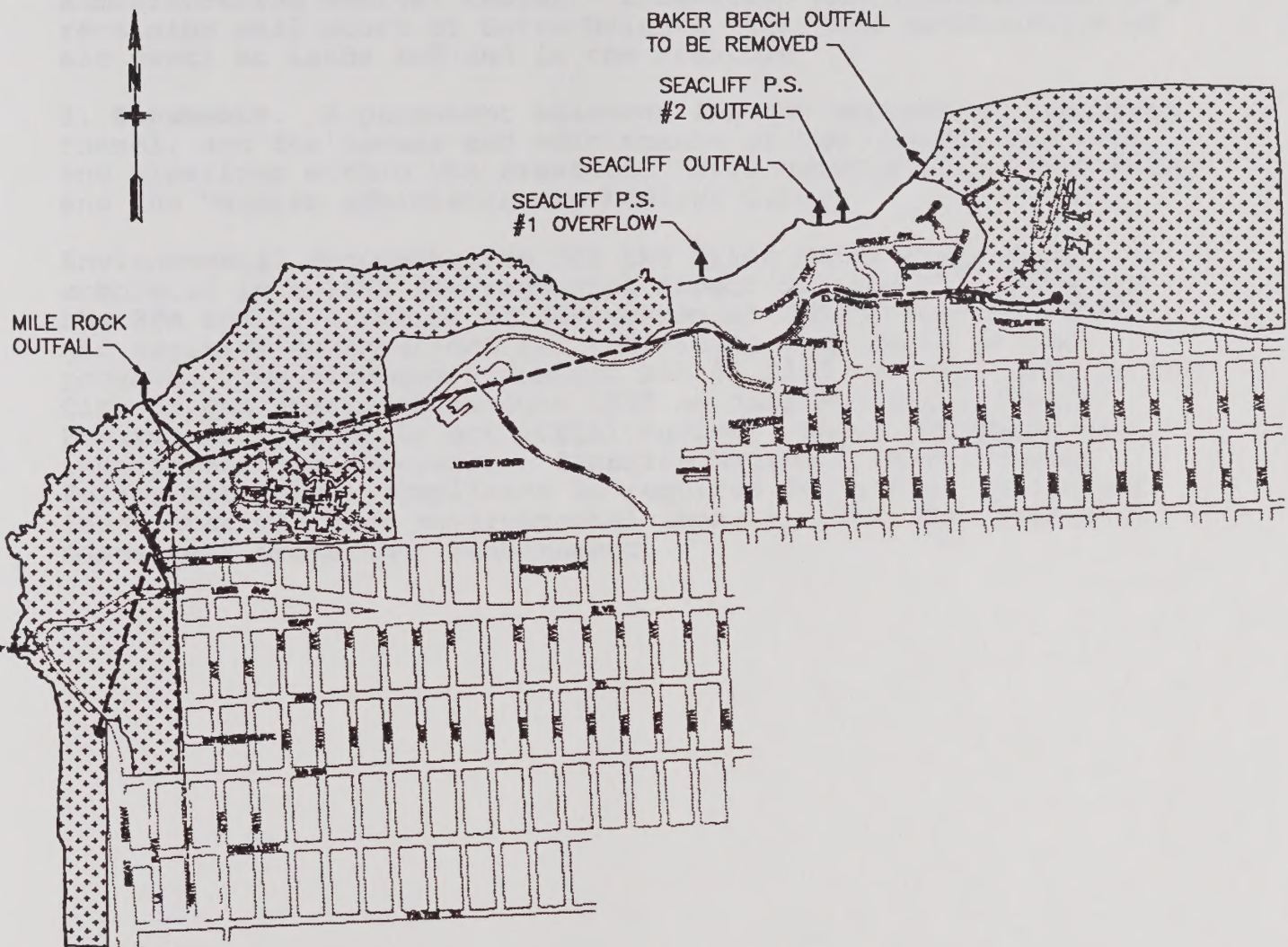
Legend:

- Complete, Currently in Operation
- Under Construction
- In Planning or Design



Not to Scale

Richmond Transport Project



Legend:

- ↑ Existing Outfall
- Tunnel Portal
- New Tunnel
- ▣ Federal Lands

FIGURE 2



Legend:

- ↑ Transit Station
- Transit Stop
- Transit Line
- ▨ Transit Area

2. Construction of Facilities. The construction of a new wet weather pipe, wastewater tunnel and associated facilities on Presidio lands in the vicinity of Lobos Creek, and beneath federal lands at Sutro Heights Park, Fort Miley and the Veteran Administration Medical Center. Excavation and construction of a retaining wall south of Sutro Heights Park, and construction of air vents at Lands End and in the Presidio.

3. Easements. A permanent easement for the wastewater transport tunnel, and for access and maintenance of the tunnel, air vent and pipelines within the Presidio, Sutro Heights Park, Fort Miley and the Veteran Administration Medical Center.

Environmental documentation for the Clean Water Program was completed in a 1973 Environmental Impact Statement prepared by the EPA and by a series of Environmental Impact Reports (EIRs) and negative declarations for individual components of the program. The Richmond Transport EIR 87.240E was certified by the City of San Francisco in June 1990 as completing California Environmental Quality Act (CEQA) review. These documents are incorporated by reference. Separate National Environmental Policy Act (NEPA) compliance is required for action on federal lands that may have environmental impacts. This Environmental Assessment meets that requirement.

PURPOSE AND NEED

The Richmond Transport is proposed in response to mandates of the California Regional Water Quality Control Board (RWQCB) and the U.S. Environmental Protection Agency (EPA) to reduce combined sewer overflows in the northwest portion of San Francisco. San Francisco's present combined sewer system does not have the capacity to handle wet weather flows within the project area.

Currently, during wet weather, combined flows (consisting of a combination of untreated sewage and stormwater runoff) from the Richmond/Sea Cliff neighborhoods exceed the capacity of the city's sewage system. The excess wastewater overflows through four outfalls into San Francisco Bay at/near China and Baker Beaches. These overflows occur on the average of 40 times per year and directly impact the beaches and waters of the GGNRA. The Regional Water Quality Control Board has issued a cease and desist order requiring that these occurrences be reduced from 40 to 8 times per year by March 1996. The Richmond Transport Project will comply with this order by diverting overflow wastewater through a 10,200 foot long tunnel which will connect with the Westside Transport and Oceanside Treatment Plant and outfall.

The Richmond Transport Project Final EIR was certified in 1990, approving this alternative, which was identified in that document as Alternative R-2. Based on the alignment of the approved alternative, construction staging and access areas are needed to construct portions of the projects within and adjacent to federal lands. Currently the City has an easement on federal land across Lobos Creek and the Baker Beach overflow parking area for the existing 5 foot diameter wet weather box sewer and a 6.5 foot diameter wet weather overflow pipe running the length of the unpaved roadway/parking area (See Figure 3). Both pipes connect into a large diameter pipe where wastewater from the Richmond/Seacliff area is discharged through the Baker beach outfall into San Francisco Bay. The outfall structure is unsightly and is situated in a way that untreated combined sewer overflows directly onto the beach in a high visitor use area.

Construction of the Richmond Transport, reactivation of the Mile Rock outfall to accommodate the allowed overflows, and upgrading the 6.5 foot diameter wet weather overflow pipe in the Lobos Creek area will allow the abandonment and removal of the Baker Beach outfall, and significantly reduce the number of overflows through the remaining outfalls. Both the 6 foot diameter Seacliff outfall and the Sea Cliff Pump Station no. 2 outfall will remain in place, but will overflow 8 or less times per year rather than the 40 times per year that they now overflow. Weirs and baffles will be installed to eliminate solids and floatables. The peak volume of the flow from the Seacliff outfall would be reduced from 386 million gallons per day to 30 million gallons per day.

The National Transportation Commission is authorized to conduct an investigation of the proposed project and to report thereon to the President and the Secretary of the Interior. The Commission is also authorized to conduct such other investigations as it may deem necessary and proper.

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DESCRIPTION OF THE ALTERNATIVES

Description of Proposal

Overview

The Richmond Transport consists of a 10,200 foot long by 14 foot diameter wastewater tunnel beginning at the Great Highway near Sutro Heights Park and ending in the Presidio near Lobos Creek. 4,800 feet of this tunnel will pass under federal lands. Construction would begin in mid-1993 and will take approximately 30 months. The tunnel depth would range from 15 to 320 feet. It would pass beneath federal lands at the Presidio, (US Army land within the boundary of GGNRA), the Veterans Administration Medical Center at Fort Miley, GGNRA lands at Fort Miley and Sutro Heights Park. With the exception of a retaining wall at the western terminus, air vents at Fort Miley and the access hatch in the Presidio, the entire tunnel would be underground, with no visible structures. The tunnel would connect to the Mile Rock outfall which would replace the Baker Beach outfall as the primary wet weather overflow point on the northwest portion of the City. The tunnel would also connect to a new 1500 foot long 10 foot diameter wet weather line in the Presidio. This line will replace the existing 6.5 foot diameter wet weather line which parallels Lobos Creek, providing the necessary hydraulic conditions.

Above ground construction activities on federal lands would take place in the Presidio, at Lands End and Sutro Heights Park. Above ground construction would be required for tunnel portals, the new 10 foot diameter pipeline in the Presidio and air vents.

Construction Activity in the Presidio

Within the Presidio, construction activities consist of excavation, tunneling, pouring concrete and grading. Construction here would include the tunnel portal and a 1500 foot long, 10 foot diameter wet weather pipe to replace the existing 6.5 foot pipe which runs beneath the unpaved roadway adjacent to Lobos Creek. This upgrade is required to handle existing flows and surges which would occur during wet weather conditions. A shaft 30 feet square and 20 feet deep would be excavated for the portal construction. The existing sewer lift station operated by the Army would remain and would be expanded by approximately 600 square feet to include a sodium hypochlorite tank and feed system for odor control and bubbler system to measure the flow level in the tunnel. The Lobos Creek box culvert which carries the creek flow under Lincoln Boulevard would be removed during construction. Lobos Creek flow would be rerouted from the culvert and pumped to the Presidio's intake structure during construction, maintaining creek water levels.

During the 30 month construction period, 5.0 acres of the overflow parking area and adjoining ballfield will be used to store

Geographical Features

Overview

The Airfield is situated on a 10.50 acre plot of land. The terrain is generally flat, with some low-lying vegetation. The airfield is bordered by a fence on the north and east sides. The south side of the airfield is adjacent to a road. The west side of the airfield is bordered by a fence. The airfield is situated on a 10.50 acre plot of land. The terrain is generally flat, with some low-lying vegetation. The airfield is bordered by a fence on the north and east sides. The south side of the airfield is adjacent to a road. The west side of the airfield is bordered by a fence. The airfield is situated on a 10.50 acre plot of land. The terrain is generally flat, with some low-lying vegetation. The airfield is bordered by a fence on the north and east sides. The south side of the airfield is adjacent to a road. The west side of the airfield is bordered by a fence.

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Geographical Features in the Vicinity

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materials and provide a staging area for loading and unloading trucks. After construction of the tunnel, the culvert would be replaced and all disturbed areas will be regraded and/or revegetated as approved by the NPS. (The location of proposed construction and material storage areas proposed in the Presidio are shown on Figure 4).

Demolition in the Presidio

Federal legislation [16 USC Section 460bb-2(i)] which established GGNRA included the Presidio within the GGNRA boundaries and placed stringent restrictions on new construction and development on Presidio lands. New construction and development is limited to the demolition and replacement of existing structures. The project proposes to demolish the existing Baker Beach outfall, a concrete structure approximately 820 square feet in area and expand the existing lift station near Lobos Creek by 600 square feet.

Construction at Sutro Heights Park

At Sutro Heights Park the lower slope near the Great Highway will be graded and stabilized in order to protect the drop shaft and allow tunnel boring to occur in solid rock. Grading would temporarily affect approximately 2400 square feet within GGNRA boundaries. Construction of the tunnel entrance would occupy a 1500 square foot portion of GGNRA land south of Sutro Heights Park at the foot of the slope near the Great Highway. (See Figure 5 for details). This entrance portal would be active for the 30 month duration of the project. Permanent structures on federal land at this site would consist of a buried retaining wall.

Construction and Construction Staging at Fort Miley

At Fort Miley construction would consist of boring two 2 foot diameter vent shafts and placing two permanent at grade vents near the USS San Francisco Memorial parking lot. (See Figure 6 for details). Construction would last for 3 months. Construction staging would require use of approximately 5-10 parking spaces. Activities at the Mile Rock outfall would consist of sand removal and rehabilitation of the outfall. All construction related activities, materials and access to rehabilitation of the Mile Rock outfall will be by barge or through the entrance portal. The City has an existing easement through the Lands of the GGNRA. Construction activities at the Mile Rock Outfall may require an addition temporary easement to rehabilitate the outfall.

Alternatives Considered but Rejected

The Richmond Transport EIR prepared for this project presented a description of five project alternatives: R-1, , R-4(A), R-6 and R-6(B). These alternatives were addressed at an equal level of detail. Based on the environmental and public review process Alternative R-2 was selected as the apparent best alternative by the San Francisco Board of Supervisors. A summary of the

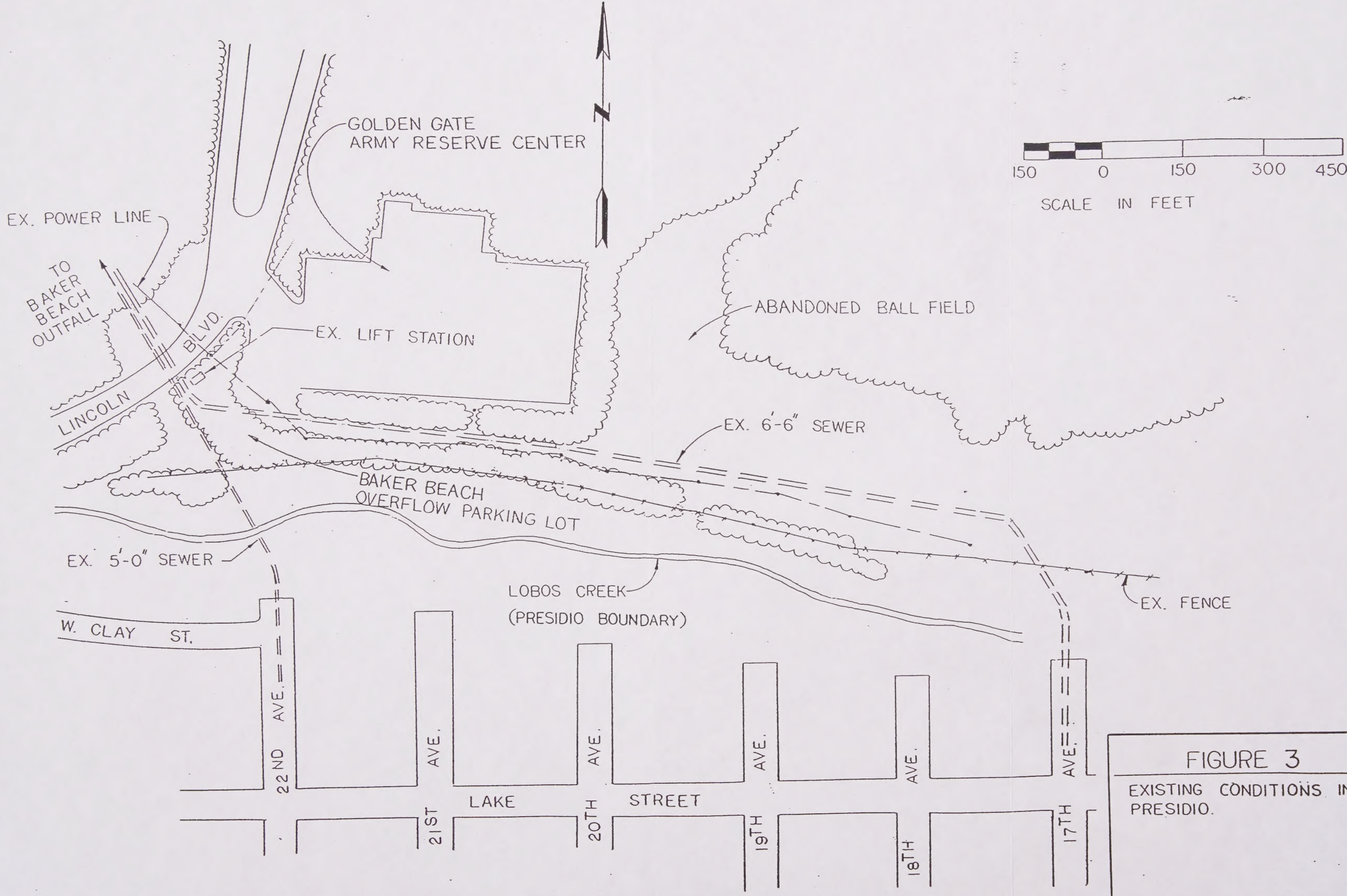


FIGURE 3
EXISTING CONDITIONS IN
PRESIDIO.



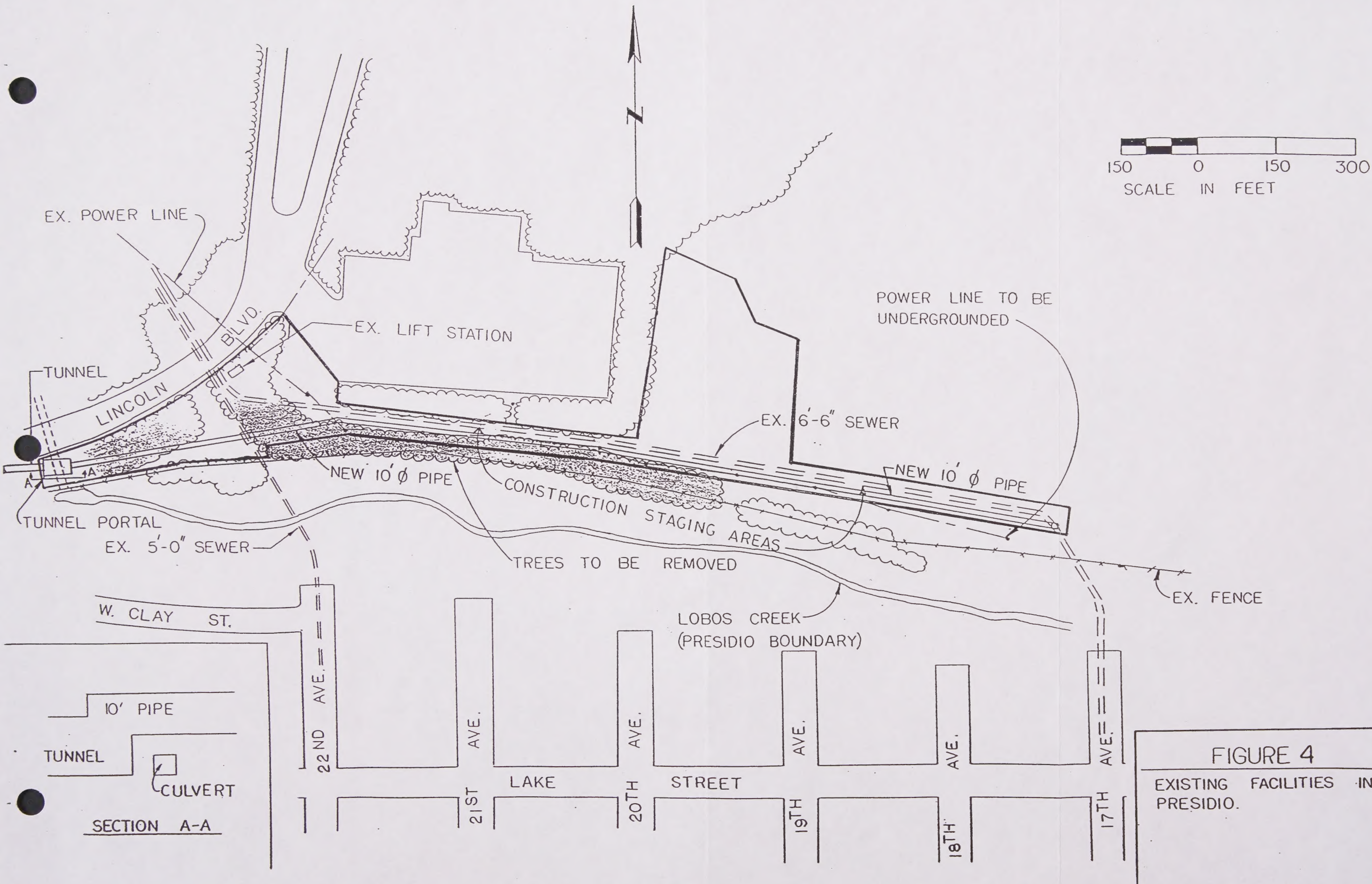


FIGURE 4
EXISTING FACILITIES IN
PRESIDIO.





PROPOSED MILE ROCK OVERFLOW VENTS
AT FORT MILEY

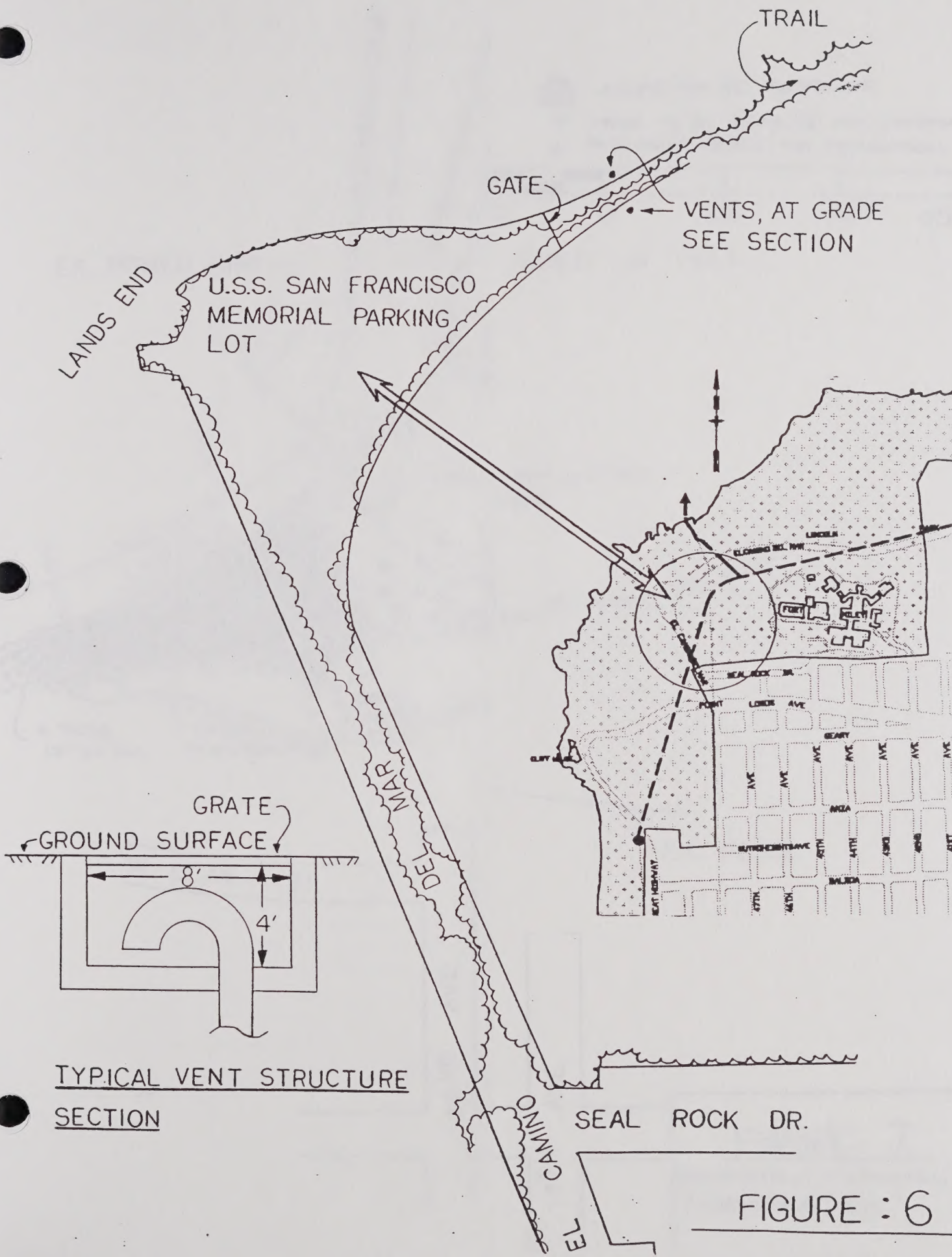


FIGURE : 6



FIGURE 6

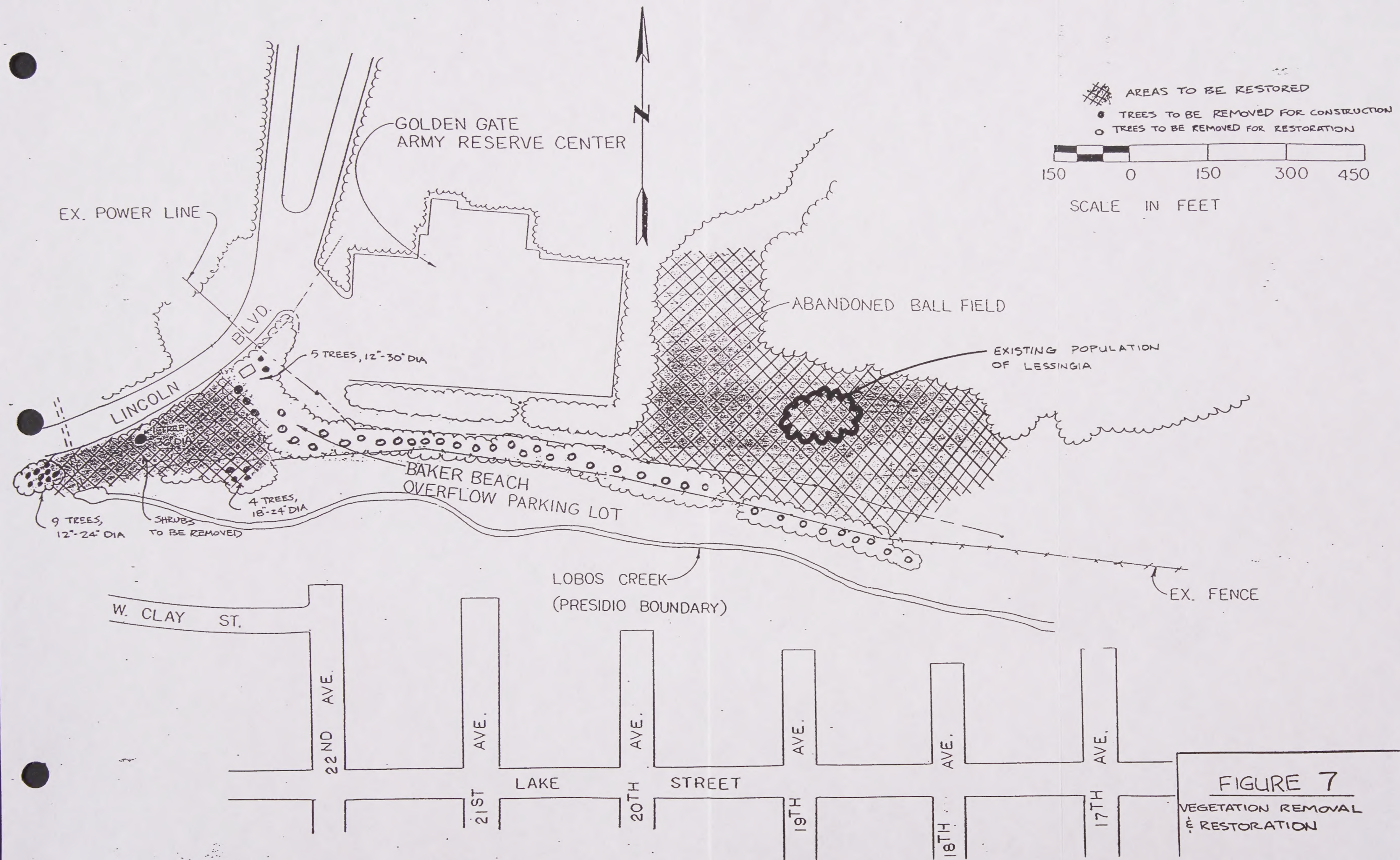


FIGURE 7
VEGETATION REMOVAL
& RESTORATION



ARMY RESERVE CENTER
CALIFORNIA BATT

EX. POWER LINE

LINCOLN

OVERSEAS

W. CLAY ST.

alternatives considered can be found on pages 11 to 46 of the Richmond Transport EIR and is attached as Appendix A.

Alternative R-1, consisted of a 9 million gallon underground retention box (50'x25'x1000') and an above ground lift station at the Baker Beach overflow parking area and open space adjacent to Lobos Creek in the Presidio. This alternative would not require tunneling beneath the Veterans Administration Medical Center, Fort Miley and Sutro Heights Park. All construction would occur on federal lands within the Presidio of San Francisco. The impacts of this alternative were not acceptable to the National Park Service or the Army and it was eliminated from consideration.

No Action Alternative

For the purposes of this document, No Action is considered to be no construction on federal lands. The Richmond Transport EIR presented two alternatives that would not require the use of federal lands. These are alternatives R-6 and R-6(B). Both alternatives proposed a wastewater tunnel beneath City lands and cut and cover excavation on City streets.

There would be no construction on or beneath federal lands if one of these alternatives were selected. A summary of these alternatives can be found on pages 25 to 46 of the Richmond Transport EIR (Appendix A).

MITIGATION FOR PROPOSAL

Mitigation for this project includes by reference those mitigation measures identified on pages 171 - 184 of the Final Richmond Transport EIR. Other mitigation for construction related impacts has been identified and incorporated in subsequent discussions between the National Park Service, the Army and Clean Water Program. Mitigation measures which are pertinent to activities proposed on federal lands are as follows:²

1. Clean Water Program will coordinate in the development of seismic design criteria with National Park Service and the United States Geological Survey (USGS). The USGS will participate in the development and review of seismic parameters and design criteria on behalf of federal agencies.

²All mitigation measures are the responsibility of the Clean Water Program.

2. Clean Water Program shall prepare a detailed sedimentation and erosion control plan to prevent erosion and sedimentation along the Lobos Creek channel due to construction activities if the elevated crossing is replaced. This plan would include prevention of runoff from the tunnel portal site from entering the creek.
3. Clean Water Program shall revegetate construction areas with appropriate native plants where vegetation is disturbed by construction activities and in adjacent areas as determined appropriate. A revegetation plan will be prepared in consultation with NPS staff. Revegetation in the Lobos Creek area will include enhancement of San Francisco tree lupine moth habitat, and of the San Francisco Lessingia site. Monitoring of success, and maintenance of revegetated sites for a period of 3 years will be incorporated into the revegetation plan.
4. In coordination with the NPS and the Army, the water quality of Lobos Creek will be monitored before, during, and after construction in Lobos Creek to determine down stream impacts, if any. This monitoring will include testing the ground water prior to dewatering discharge into Lobos Creek and diverting any runoff away from Lobos Creek. Any detected decrease in water quality will be evaluated for necessary mitigation, including temporary use of City water until Lobos Creek water quality returns to preconstruction standards. Required mitigation will be implemented by the Clean Water Program.
5. The existing population of San Francisco lessingia, in the Lobos Creek area, will be protected from possible damage during project construction. The population will be fenced and signed and workers will be informed of the sensitivity of the plant population to disturbance. The Clean Water Program will assure the population is not disturbed during installation of the fence after NPS representatives identify and stake the area to be protected. Clean Water Program will also assist in expanding the population of San Francisco Lessingia through preparation and implementation of a revegetation plan for disturbed areas (see mitigation measure #3).
6. Clean Water Program shall coordinate with the NPS and Army to prepare, or have prepared, a plan to prevent adverse impacts to water quality of Lobos Creek and the suitable habitat for the San Francisco forktail-damselfly.
7. The Clean Water Program will fund the preparation of a restoration plan for Lobos Creek, which will include conceptual design of a proposed alternative. The scope of work for this report shall be prepared with the assistance of the National Park Service staff.

8. The Clean Water Program shall develop and implement plans for removal of the Baker Beach outfall and the grading, stabilization and revegetation of this site. Plans will be approved by NPS and Army.
9. The Clean Water Program shall construct a restroom facility at the south Baker Beach parking lot.
10. Clean Water Program will work with the NPS and Army to identify and implement appropriate parking improvements to accommodate Baker Beach overflow parking during project construction. Grading/curbing and striping road shoulders and modifications to Bowley Street to accommodate parking will be considered.
11. The contractor will be required to design and install a sufficient number of observation wells to comply with groundwater control requirements and to determine the safety of all facilities and structures, both temporary and permanent. Ground water monitoring will be conducted on a regular basis in the vicinity of the Lobos Creek tunnel portal during construction to ensure groundwater quality is not affected by construction activities.
12. Prior to construction, a subsurface archaeological exploration program will be conducted to determine the presence or absence of archeological and historic resources. If significant resources are found, a mitigation procedure approved by the State Historic Preservation Office and the Advisory Council for Historic Preservation will be followed. This procedure is presented in greater detail in the Richmond Transport EIR, Pages 184-186.
13. Inspection of the City's tunnels and sewer facilities within the Presidio will be conducted on a regular basis and also following any seismic events. Any potential cracks or areas of leakage will be repaired at the soonest possible time. A contingency plan will be developed to assure that a supply of drinking water is available to the Presidio in the event that Lobos Creek water quality is affected by leakage from the pipes.
14. Tunnel design specifications will include criteria for watertightness. In the area near Lobos Creek, the tunnel will be fitted with a waterproof liner or equivalent measures to prevent leakage.
15. Any construction which results in modifications to Lobos Creek associated with the rerouting of potable water to the Presidio will be coordinated with representatives of the NPS, Army and Corps of Engineers to ensure that the concerns and requirements of these agencies can be incorporated into

the proposed improvements. Jurisdictional determinations and any necessary mitigation which would be required would be subject to the provisions of Section 404 of the Clean Water Act and Section 1603 of the Fish and Game Code.

16. Clean Water Program will work with the NPS and Army to assure that during construction, when the Lincoln Boulevard culvert is not usable to transport Lobos Creek water, other means will be made available to provide continuous flow of water from Lobos Creek to the Presidio's water intake system. The system will limit water level fluctuation to prevent impacts to the Lobos Creek ecosystem. If Lobos Creek water is not available for potable use, Clean Water Program will pay for water utilized through the existing San Francisco Water Department meters connected to the Presidio's water system.

Creek flow will be monitored prior to and during any dewatering activities to ensure that dewatering does not adversely affect creek flow. If unacceptable changes in creek flow are identified, dewatering will cease until measures are in place to adequately protect creek resources, water quality and water quantity. A dewatering plan will be developed to including measures for reducing sediment, determining water quality, erosion and creek level controls prior to discharge back into the Lobos Creek.

17. A detailed site-specific geologic/geotechnical investigation will be conducted for the selected route by a qualified geotechnical consultant. The geotechnical study will include field exploration, subsurface exploration, laboratory testing, and engineering analysis to evaluate possible slope deformations along the construction route and to examine the potential effect of tunneling on slope stability and settlement in overlying areas. In addition, the study will develop appropriate construction/design measures to assure structural integrity of the facility and to protect existing surface structures from tunneling. The project sponsor will follow the recommendations of that study during design and construction of the project. More specifically, the project sponsor will follow all recommendations to minimize settlement and to assure slope stability in and adjacent to cut-and-cover trenches and at tunnel portal construction sites. Construction practices to minimize settlement would be site-specific but could include filling behind the walls placed in the trenches, placement of additional bracing, and strengthening of the wall elements.
18. Prior to construction, additional soil borings will be completed in the Presidio, as necessary, to identify the vertical extent of unstable materials and to determine

appropriate construction techniques and design parameters to minimize the potential for impacting the existing slope stability.

19. The existing overhead utility lines along Lobos Creek will be placed underground from the Pump Station to the approximate area of the extension of 17th Avenue north of Lobos Creek.

AFFECTED ENVIRONMENT OF PREFERRED ALTERNATIVE

1. Vegetation and Wildlife

The proposed project will be constructed in an area of both landscaped and natural habitats. The tunnel below federal lands would be 35 to over 300 feet below ground except within the Presidio where cut and cover construction will be required.

Presidio

Lobos Creek flows along the southern boundary of the Presidio and is bordered by residential development to the south. Portions of the Lobos Creek corridor are relatively undisturbed and support native riparian vegetation, and as the only coastal stream and one of the last remnants of riparian habitats in San Francisco, it provides some of the most important wildlife habitat in the Presidio. A chain link fence prohibits public access to the creek, which provides 70% of the Presidio's water supply.

The Lobos Creek riparian vegetation consists of two plant communities, as described in the California Natural Diversity Data Base (CDF&G, 1986): Central Coast Live Oak Riparian Forest and Arroyo Willow Riparian Forest. The riparian vegetation east (upstream) of Lincoln is dominated by natives: Coast live oaks, willow, alder, poison oak, dogwood, wild cucumber, snowberry, California blackberry, elderberry, equisetum and bracken fern, sedges and rushes, and tree lupine. Alien species include eucalyptus and Monterey pine and watercress. The riparian vegetation west (downstream) of Lincoln Blvd. is dominated by aliens including eucalyptus, Monterey pine and cypress trees, german ivy, nightshade, nasturtium and mattress vine. In the understory, these alien species threaten the health of the native plant communities. Vegetation in the downstream portion of the creek is subject to trampling by pedestrian activity and is shaded by large Monterey pine and cypress trees.

The vegetation bordering the parking and access road consists of Non-Native Grassland, and includes ice plant. There are over 50 Monterey pine trees in two rows that line either side of the parking area and adjacent unpaved road. The Lincoln Boulevard road shoulder is landscaped with non-native shrubs and trees including acacia, Monterey pine and eucalyptus. Native species along Lincoln Boulevard include Coast live oak and lupine. The abandoned ballfield and adjacent meadow include Non-Native

Grassland and Northern Foredune Grassland communities. San Francisco lessingia is found in this area, outside of area of proposed construction activity.

Wildlife observed in the Lobos Creek area includes many bird species (see bird list Appendix B) as well as small mammals such as raccoon and pocket gopher. Stickleback have been observed in the creek.

As part of the Richmond transport EIR, a records search and a field study were conducted to determine the likelihood and existence of special-status taxa in the Lobos Creek riparian corridor in 1988 (page 81 R/T EIR). The special-status taxa records search for the northwest portion of San Francisco identified ten plant and three animal taxa. The list of special status taxa is identified in Table 1.

Special-Status Taxa	Location	Abundance	Notes
San Francisco lessingia	San Francisco lessingia	10	San Francisco lessingia

TABLE 1

Special-Status Taxa	Location	Abundance	Notes
San Francisco lessingia	San Francisco lessingia	10	San Francisco lessingia
San Francisco lessingia	San Francisco lessingia	10	San Francisco lessingia
San Francisco lessingia	San Francisco lessingia	10	San Francisco lessingia

Notes: Potential occurrence based on recorded geographic range (COWLEY, 1987) presence of suitable habitat for each taxa in concern and from 1988 field.

1. The San Francisco lessingia is a rare plant species that is found in the San Francisco lessingia community. It is a rare plant species that is found in the San Francisco lessingia community.
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Gravel and broken stones are common in the
stream bed. The water is clear and the
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While the water is clear, the bottom is
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Table 1

Specific Name	Common name	Status (State/Fed/CNPS)	Potential Occurrence
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PLANTS

<u>Arenaria paludicola</u>	Swamp Sandwort	-/C2/1B	High potential
<u>Grindelia maritima</u>	San Francisco gumplant	-/C2/1B	High potential
<u>Lessingia germanorum</u> var <u>germanorum</u>	San Francisco Lessingia	-/C2/1B	High potential
<u>Orthocarpus floribundus</u>	San Francisco owl clover	-/C2/1B	High potential
<u>Plagiobothrys diffusus</u>	San Francisco allocarya	E/C2/1A	Presumed extinct
<u>Silene verecunda</u> ssp. <u>verecunda</u>	San Francisco campion	-/C2/1B	Moderate potential
<u>Chorizanthe cuspidata</u>	<u>San Francisco</u> <u>spineflower</u>	<u>-/-/1B</u>	<u>High Potential</u>

ANIMALS

<u>Grapholita edwardsiana</u>	San Francisco Tree lupine moth	-/C3	Recorded population
<u>Icaricia icariodes</u> <u>missionensis</u>	Mission blue butterfly	-/E	Low Potential
<u>Ischnura gemina</u>	San Francisco forktail damselfly	-/C1	Moderate potential
<u>Rana aurora draytoni</u>	Red legged frog	-/C1	Recorded Population(1954)

Notes: Potential occurrence based on recorded geographical range (CNDDDB, 1987) presence of suitable habitat for each taxa of concern and from GGNRA files.

Federal	=	U.S. Fish and Wildlife Service (USFWS, 1989; USFWS, 1989A)
E	=	Listed as "Endangered under the federal Endangered Species Act.
C1	=	A "Candidate" species under review for federal listing. "Category 1" includes species for which the USFWS presently has substantial information on biological vulnerability and treats to support the appropriateness of proposing to list them as endangered or threatened species.
C2	=	A "Candidate" species under review for federal listing. "Category 2" includes species for which the USFWS presently has some information indicating that "proposing to list them as endangered or threatened species is possibly appropriate. but which further biological research and field study is usually needed to determine their biological vulnerability and treats.
C3	=	No longer a Candidate for federal listing. "Category 3" species are too common to be eligible for federal listing, but may still qualify for protection under state law.
State		
E	=	California Department of Fish and Game (CDFG, 1988, CDFG 1988a)
CPNS	=	California Native Plants Society (CPNS, 1984)
1A	=	Plants presumed to be extinct in California.
1B	=	Considered rare or endangered in California and elsewhere, if

Specific name Common name Locality Date

<i>Acrida agrippa</i>	Agrippa	Agrippa	1971
<i>Acrida agrippa</i>	Agrippa	Agrippa	1971
<i>Acrida agrippa</i>	Agrippa	Agrippa	1971
<i>Acrida agrippa</i>	Agrippa	Agrippa	1971
<i>Acrida agrippa</i>	Agrippa	Agrippa	1971
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<i>Acrida agrippa</i>	Agrippa	Agrippa	1971
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<i>Acrida agrippa</i>	Agrippa	Agrippa	1971
<i>Acrida agrippa</i>	Agrippa	Agrippa	1971
<i>Acrida agrippa</i>	Agrippa	Agrippa	1971
<i>Acrida agrippa</i>	Agrippa	Agrippa	1971
<i>Acrida agrippa</i>	Agrippa	Agrippa	1971

Notes: The above table shows the distribution of the species in the area. The numbers in parentheses indicate the number of specimens collected for each species.

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- present outside of California (probably meets criteria for state listing)
- 4 = Of limited distribution in California and possibly elsewhere, but not presently rare or endangered (does not now meet criteria for state listing, but may in future)

Field studies done in the area of the proposed improvements did not observe any special-status taxa.³ However, studies did identify suitable habitat for the forktail damselfly. Tree lupine plants were observed on the east side of Lincoln Blvd.⁴ Tree lupine moth larvae was collected during the field survey; and a field survey to assess the habitat of Lobos Creek to support the San Francisco garter snake was performed. The field survey identified only a marginal habitat and no primary food sources (the Red Legged Frog) to support this variety of garter snake.⁵

A population of San Francisco lessingia, a plant listed as an endangered species by the State of California, is located in the sandy open space area east and north of the construction zone. (See Figure 4 for location of this population of San Francisco lessingia). This population is threatened by invading alien annual grasses which could severely degrade, if not eliminate the population.

Sutro Heights Park

Vegetation on the west slope of Sutro Heights Park includes both native and introduced plant species. Northern Coastal Bluff Scrub community components are found in the project site as well as a mixture of native and alien herbs, shrubs and grasses. The dune tansy, identified in the area, is considered rare by the California Native Plant Society, but is not found at the project site.

Fort Miley

The project area is a paved parking lot and trail, formerly El Camino del Mar. No vegetation exists on the project site.

2. Visitor Use and Access/Management Needs

Presidio

The open space in the vicinity of Lobos Creek that will be affected by construction is used informally by visitors for dog walking, bird watching and other unstructured activities.

³James A. Martin, Consulting Biologist, 1988

⁴ DeBenedictis, John A. 1988 Survey of Lobos Creek August - September, 1988

⁵McGinnis, Samuel M. Dr. Evaluation of Lobos Creek as potential habitat for San Francisco garter snake

The unpaved roadway and parking area adjacent to Lobos Creek is used as an overflow parking area for Baker Beach. Approximately 100 cars are accommodated in the unpaved area on an average of six warm weather days each year when visitation exceeds the capacity of the Baker Beach parking lots and road shoulders.

This area also provides parking for access to the Lobos Creek area and informal trails. Access to the parking area is from Lincoln Boulevard, either through the Presidio or from 25th Ave and El Camino Del Mar in the Sea Cliff area of San Francisco. A ballfield exists in the open space area adjacent to Lobos Creek. This ballfield has not been maintained or used in recent years. An unpaved road to Lobos Creek at the culvert inlet is used by the Presidio for maintenance access.

Fort Miley

The project area near Fort Miley consists of a parking lot, hiking trail and the U.S.S. San Francisco Memorial, a World War II monument and popular viewing area. Approximately 85 cars can be accommodated in the parking lot, however the capacity is rarely fully utilized. The parking lot is used for trailhead access to the Lands End Trail and enjoying the views from the site. Primary vehicle access to the project area is from Point Lobos Avenue.

Sutro Heights Park

The project area at the foot of Sutro Heights Park is an open area that receives little public use at this time. It is located at the boundary of GGNRA and private property, adjacent to the Great Highway.

3. Drainage and Water Supply

Drainage

Lobos Creek, a perennial stream approximately 1.3 miles long, is located along the south boundary of the Presidio. The source of water for Lobos Creek is groundwater, and the creek receives almost no surface runoff. The creek is fed by a series of springs on the south bank, primarily between 16th and 18th Avenue. The source of spring water flowing into Lobos Creek is likely groundwater contained in the underlying dune sand and/or Colma Formation.

Lobos Creek is free flowing from the south side of the Presidio near the terminus of 15th Avenue to Lincoln Boulevard. At Lincoln Boulevard Lobos Creek flows through a culvert. Lobos Creek returns to a free flowing condition at a point west of the diversion structure, where it is returned to a culvert which connects into the Baker Beach outfall, terminating at the beach.

The original study was carried out in 1968 and 1969 as an investigation into the effects of the use of the land in the area of the study. The study was carried out in the area of the study and the results of the study are given in the report.

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1. Introduction

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Water Supply and Quality

Currently much of the flow of Lobos Creek is used to provide about 70% of the Presidio's total annual water supply. (Pg. 77 R/T EIR) The balance comes from the San Francisco Water Department and from wells located next to Lobos Creek. Water from Lobos Creek and from the well field is generally of good quality. Ground water in the area is generally in a confined area defined by dune sands and possibly within the Colma Formation. Groundwater occurrence within the bedrock is not well documented.

Water from Lobos Creek is diverted west of the Lincoln Blvd. crossing and piped to a down stream filtration plant. All water not diverted, and water entering the creek west of the diversion is discharged through the Baker Beach outfall to the bay.

With the transition of the Presidio from the Army to the Department of the Interior there has been an increased interest in identifying sufficient ground water sources to satisfy future needs as an alternative to the current level of use of surface water from Lobos Creek.

Public Utilities

Overhead utility lines parallel Lobos Creek. These power lines provide electricity to operate the sanitary lift station and connect to Pacific Gas and Electric lines at the extension of 17th Avenue in the Presidio.

The City of San Francisco has an easement for a 6.5 foot wet weather sanitary sewer line which also runs parallel to Lobos Creek beneath the unpaved roadway and adjacent meadow. This line also serves the Army Reserve Center parking lot and other storm flows within the Presidio. This line, which crosses Lobos Creek at 17th Avenue, along with a second sewer line which crosses over Lobos Creek at the extension of 22nd Avenue, transports combined storm overflows to the Baker Beach outfall.

4. Cultural Resources

The project will be constructed within the Sutro Historic District and the Presidio National Historic Landmark. The Sutro Historic District was nominated and determined ineligible for the National Register in 1979. The nomination is currently being revised and resubmitted based on an evaluation of the cultural landscape values. The tunnel portal and Mile Rock outfall vent are within the District.

The proposed project in the Presidio occurs within the boundaries of the National Historic Landmark. The sewage lift station is a non contributing structure. (NPS: Presidio Structure Inventory 12/90)

Lobos Creek, approximately one mile long, is identified as a location of archeological sensitivity. Lobos Creek was used during Native American, Spanish, Mexican and early American cultural periods. In the recent past Lobos Creek provided the City with water. Originally elevated wooden flumes and then brick conduits brought water to the North Beach area of San Francisco from 1855 to 1893. (Page 85 R/T EIR)

A cultural resources evaluation for the Richmond Transport was performed by David Chavez in 1980. The objective of the resource evaluation was to determine potential subsurface archeological and historic resources in the project area. An additional study was performed by David Chavez and Associates in 1988 for the Lobos Creek area.

No prehistoric archeological sites were recorded in the immediate environs of Lobos Creek. However, environmental factors were favorable around Lobos Creek to support both temporary and permanent encampments and buried cultural deposits could be present within the construction area. (page 85 R/T EIR) Historically significant remains of the water supply structures dating back to 1855 are located north of the project site. (Chavez, 1988) A water diversion dam located south west of Lincoln Blvd. may be buried in the land bridge.

5. Geology

The geology of San Francisco is characterized by north-northwest hills underlain by bedrock that is covered by unconsolidated sands of the Colma Formation. The bedrock consists of sedimentary, volcanic and metamorphic rocks. The Lobos Creek corridor dissects these formations exposing the Colma Formation sands and various materials that created the bedrock formation. The Sutro Park and Fort Miley areas have similar geological development. Sutro Park is distinguished by the exposed bluffs also made of sandstone. (page 69-72 R/T EIR)

Landslide activity is prevalent along the western shoreline of San Francisco. The Fort Miley area has experienced landslide activity in the recent past and a major failure of the slide area occurred in 1925. El Camino Del Mar between Fort Miley and Lincoln Park is closed to vehicular access because of slide activity. The tunnel alignment will be through Franciscan formation rock and significantly below the active landslide areas. (page 71 R/T EIR)

The area of the proposed tunnel is also in a seismically active region due to its proximity to the San Andreas Fault. The project is approximately 3 miles east of the San Andreas fault. Other active faults are the Hayward and Calaveras faults which are 15 miles east of the project. The maximum credible earthquake that would impact the project area would be the San Andreas Fault at 8.25 on the Richter scale.

ENVIRONMENTAL IMPACTS

The Proposal

The impacts of the proposal on federal lands would occur at the Lobos Creek area of the Presidio, The USS San Francisco Memorial parking lot adjacent to Fort Miley and at the foot of Sutro Heights Park. The tunnel excavation under the Veterans Administration Hospital would be approximately 250 feet below ground level. Noise and vibration from tunnel excavation would be negligible from that depth.

1. Impacts to Vegetation and Wildlife

Construction activities which could affect vegetation on federal land would generally be limited to the Lobos Creek overflow parking area and adjacent open space in the Presidio; and at the foot of Sutro Heights Park.

Presidio

The tunnel portal construction and adjacent staging area would require the removal of 1.8 acres of landscaped vegetation along the east embankment of Lincoln Boulevard including a total of 19 mature pine, eucalyptus and cypress trees. The construction staging in the ballfield area would disturb or remove 2.5 acres. Construction of the 10 foot wet weather line would require the removal of approximately .7 acres. (See figure 4 for location of vegetation to be removed in the Lobos Creek overflow parking area).

Revegetation of the riparian corridor and native grassland proposed as mitigation would include the removal of approximately 35 Monterey pine trees on the south side of the unpaved road and growing in the grassland. The trees are to be removed to restore native plant communities affected by shading and competition from the non-native trees. These non-native trees would be removed after the construction of the 10 foot wet weather line.

Tree removal will occur in phases to reduce potential impact on birds, and allow for their gradual replacement with native species. Monterey pines growing on the north side of the unpaved road would be retained and additional trees planted to better screen currently exposed borders of the Army Reserve Center. The expansion of the existing lift station would not have an impact on the surrounding vegetation. A total of 7.5 acres will be restored with native species and other plant materials. (See Figure 7 for area of restoration).

Protection of sensitive native vegetation during construction, and revegetation of approximately 7.5 acres with appropriate native vegetation as described in mitigation measure #3, would offset the temporary construction impacts that would result from the project.

The Project

The purpose of the proposed project is to develop a new water supply system for the City of Los Angeles. The project will involve the construction of a new water treatment plant and the installation of a new water distribution system. The project is expected to provide a reliable and safe water supply for the City of Los Angeles and its surrounding areas. The project is also expected to provide a significant economic benefit to the City of Los Angeles and its surrounding areas.

1. Summary of Project and Objectives

The project is a water supply system for the City of Los Angeles. The project is expected to provide a reliable and safe water supply for the City of Los Angeles and its surrounding areas. The project is also expected to provide a significant economic benefit to the City of Los Angeles and its surrounding areas.

2. Objectives

The project has several objectives. The first objective is to provide a reliable and safe water supply for the City of Los Angeles and its surrounding areas. The second objective is to provide a significant economic benefit to the City of Los Angeles and its surrounding areas. The third objective is to provide a significant environmental benefit to the City of Los Angeles and its surrounding areas.

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Wildlife in the project area would be disturbed by the noise and activity associated with construction. Mobile species (small mammals, birds, reptiles, insects) would move away from active sites and return as project activities cease, and restoration activities are carried out.

Special Status Species.

The California Natural Diversity Data Base and NPS records were consulted to determine the possibility of special-status taxa occurring in the area. The data base identified three species that have the potential of occurring in the project area: the tree lupine moth, Mission blue butterfly and the San Francisco forktail damselfly. Of the three potential species, only the tree lupine moth has been identified in the area of Lobos Creek.⁶ The removal and replanting of several tree lupine plants, should not have an adverse effect on the moth population, due to remaining habitat for this insect in the protected creek area.

Sutro Heights Park

Construction of the entrance portal shaft would require the grading of a 1500 square foot area on the lower slope of Sutro Heights Park. The upper portion of this site includes components of the Northern Coastal Bluff Scrub community. The lower portion of the site is dominated by non-native grassland and shrub species including albizia. Revegetation of this site would utilize native species. Wildlife impacts associated with this activity would be minimal compared to other activities already occurring in this area or proposed on adjacent private land.

Fort Miley

Construction would take place within the former road bed and would not affect vegetation. Wildlife in this area would be temporarily affected by construction activity, however due to the proximity of the proposed work to the parking lot and trailhead wildlife use of this site is limited and impacts would not be significant.

2. Impacts to Recreation Activities and Visitor Use

Presidio

The tunnel construction in the vicinity of Lobos Creek would take approximately 30 months. During this period the Baker Beach overflow parking area would not be available for public use. The parking area is used to accommodate overflow parking for approximately 100 cars on approximately 6 days each year when unusually warm weather brings many visitors to the beach. The parking area and roadway is of sufficient size to accommodate the

⁶ De Benedictis, John A 1988. Survey of Lobos Creek, San Francisco, California .

...in the project area would be disturbed by the noise and

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4. Effects to Beneficial and Vernal Pools

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construction activities without impacting pedestrian access to the site except during the construction of the 10 foot wet weather pipe, when the area would be closed to public use for a period of six months.

The abandoned ballfield east of the Army Reserve Center would also be used for construction staging, eliminating any public use of this site for the 30-month project duration. This site is approximately 1.5 acres.

Sutro Heights Park

The construction activities at the entrance portal south of Sutro Heights Park would be for the 30 month project duration. Construction activities on federal land at this site would have little effect on recreation activities or visitor use, since there is little or no public use occurring here. The portion of federal land is small (1500 s.f.) and the entire flat portion of the adjacent site, which is private land, would be used for construction activities. The impact of the construction on private land was addressed in the Richmond Transport EIR.

Fort Miley

Construction within the USS Memorial Parking Lot would last 3 months. During that time construction staging would require use of approximately 5-10 parking spaces, Or approximately 6-12% of the available spaces. Temporary use of this space would not impact the public's ability to use the site. There is generally excess parking at this site.

Activities at the Mile Rock outfall would not affect visitor use and recreation activities on adjacent park lands.

3. Construction and Staging Area Impacts

All Sites

In addition to the loss of parking and impacts to vegetation already discussed, temporary construction impacts would include noise, vibration, traffic, dust and exhaust from excavation equipment. These impacts are discussed in the Richmond Transport EIR (pages 115-148 and 221-235) in greater detail for the overall project. Specific mitigation measures for these impacts are identified on pages 174-178 of the Richmond Transport EIR. Construction activities associated with the project include tunneling, excavation, pouring concrete, grading and revegetation. Construction noise except for impact equipment would range from 78 to 81 decibels (DBA) at 50 feet. Impact equipment could reach 85dBA at 50 feet (Richmond Transport EIR) During daytime hours, the maximum construction noise level permissible under the City Noise Regulation is 80dBA at 100 feet. Impact tools, pavement breakers and jackhammers are exempt from this regulation.

Presidio

The nearest noise receptor within the Presidio is the Army Reserve Center building, approximately 800 feet from the portal site and directly adjacent to the ballfield staging area. The nearest residential structures sit above the south bank of Lobos Creek, approximately 300 from the portal site. Primary noise sources at the tunnel portal would include operation of construction equipment and trucks used for transport of excavation spoils, for concrete placement and for supplies and deliveries. Noise from these activities would occur throughout the 30 month construction period. Construction activities taking place within the Presidio would be restricted to weekdays during the hours of 7AM - 8PM. Delivery of the large diameter pipe would occur during off peak hours and may extend the morning or evening construction time period to avoid conflicts with peak travel periods.

Construction traffic would enter and exit the area from Lincoln Blvd. Typical traffic would be from haul trucks, concrete trucks, and employee vehicles during the 30 month construction period. The average number of truck-trips would range from 44 to 114 per day depending on the construction activity. A truck trip is a one-way vehicle trip to and from the site; one truck load of material or one round trip represents two truck trips (page 109 R/T EIR). The nearest intersections (Lincoln/Bowley and 25th Avenue/El Camino del Mar) have sufficient reserve capacity to handle the anticipated construction traffic without a reduction in Level of Service (LOS) (NPS, 1992; COE 1989).

Construction equipment and construction activities would affect air quality. Construction equipment would be required to be maintained at 30 day intervals to reduce nitrogen oxide emissions and large stationary equipment would be subject to Air District permit requirements.

Excavation within the parking lot area would increase the amount of suspended particulate in the air. The prevailing winds would generally carry dust emissions in a west to east direction. To reduce dust emissions a fine water spray mist would be used during excavation, loading and hauling procedures. Additional mitigation to reduce wind erosion of stockpiled soil, and eliminate excavation and soil handling during wind speeds greater than 20 mph is included in the Richmond Transport EIR (pages 177-178).

4. Visual Impacts

Presidio

Construction sites would be visible from Lincoln Boulevard, residences south of the site, and from open space bordering the construction and staging areas. Fencing, if used to surround the construction site at the Presidio, would obscure some of the

construction activities, as would vegetation bordering the sites. The visual impacts associated with the portal and staging area are limited to the 30 month construction period and would not adversely affect long term views of this area.

The removal of overhead power lines and vegetation would have a longer term visual impact on the area. Removal of the power lines would enhance the natural appearance of the site. Low growing vegetation along the pipeline would be replaced in approximately one growing season. Shrubs and Monterey pine trees removed between Lobos Creek and the roadway and along Lincoln Boulevard would be replaced with native species (oak, willow and other riparian species) or species found in the cultural landscape, such as Monterey pine. Viewed from the north the tree removal would expose and expand the riparian habitat of Lobos Creek which is currently hidden by the larger trees. Views from residences along the Presidio boundary towards the Presidio would be more open, however the row of mature trees on the north side of the unpaved roadway would continue to screen views of the Army Reserve Center.

The placement of 6 foot by 8 foot concrete access covers for entering the tunnel and the wet weather sewer line and the 600 s.f. expansion of the pump station are the only permanent changes in the parking area.

Sutro Heights Park and Fort Miley

Construction activities and equipment would have a temporary visual impact similar to that described above. At Sutro Heights, regrading and revegetation would return the site to a more natural appearance. At Fort Miley, permanent at grade vents would have low visibility.

5. Impacts to Water Quality

During construction of the 10 foot diameter wet weather line, dewatering of ground water may be required. Water quality testing of the dewatered ground water would be performed to determine if the water is of sufficient quality to be returned to Lobos Creek. If the ground water is not suitable it would be discharged into the sewer system.

Currently the Army operates several wells next to Lobos Creek north of Lincoln Blvd. The tunnel crossing at Lobos creek would be over 150 feet from the well field. The Department of Health Services sets standards for the distance that sanitary facilities should be separated from wells. Chapter II, Part II, Section 8 of the Water Well Standards: State of California (DWR Bulletin 74-81) state that all wells shall be located an adequate horizontal distance from potential sources of contamination and pollution. The specified distance for sewer lines is 50 feet.

The above stated requirement is only for well situations. Where

the tunnel crosses surface water at Lobos Creek design criteria for watertightness of the tunnel play a critical role. Lobos Creek flows through a concrete culvert in the area that would be below the tunnel, providing additional protection in the case of a tunnel rupture during wet weather flows. Finally, this portion of the tunnel would be constructed with a watertight lining.

Lobos Creek provides about 70% of the Presidio's total annual water supply. (Pg. 77 R/T EIR) The removal of the culvert under Lincoln Boulevard would require flows from Lobos Creek to be diverted and pumped to the Presidio's water intake structure west of Lincoln Boulevard. Pumping water from Lobos Creek would be controlled to minimize changes in the water level of the creek. Rerouting the culverted creek flow would occur for approximately 20 months.

6. Impact to Utility Lines

The existing overhead utility line would be relocated to accommodate the 10 foot diameter pipe. Undergrounding the utilities would require trenching and laying new conduit from the pump station to the power pole near the extension of 17th Avenue. The storm drainage system from the Army Reserve Center connects to the existing 6.5 foot wet weather line that in the Presidio. Drainage from the Army Reserve Center will continue to use the 6.5 foot wet weather line that discharges out the existing Baker Beach outfall.

7. Impacts to Cultural Resources

Lobos Creek has been identified as a location of archeological sensitivity. Section 106 of the National Historic Preservation Act requires that effects on significant archeological sites and historic properties be addressed. A cultural resources evaluation on the Lobos Creek area was conducted by David Chavez and Associates in 1988. Archival research and field review have resulted in the identification of no known historic resources within the proposed project construction zone next to Lobos Creek. There are no other areas of the Presidio effected by this project. Neither the pump station at Lobos Creek nor the Baker Beach outfall are considered contributing structures.

Since the Presidio and portions of Fort Miley are National Historic Landmarks, compliance with Section 106 of the National Historic Preservation Act is required. This Environmental Assessment would be reviewed by the State Historic Preservation Office and a Determination of No Effect would be requested.

8. Relationship to Other Plans

The proposal has been reviewed by NPS staff completing the General Management Plan Amendment (GMPA) for the Presidio. The proposal is compatible with draft GMPA concepts for the Lobos Creek Valley planning area.

Impacts of the No Action Alternative

There would be no impacts of construction or demolition on federal lands. Outside of federal lands there would be longer term construction impacts, traffic delays caused by in street construction activities, impacts to air quality, transportation patterns and access to recreational facilities. The no action alternative would not cease wet weather overflows at Baker Beach or remove the overflow structure at Baker Beach. Impacts of Alternatives R-6 and R-6B, which would not be constructed on federal lands are described in detail in the Richmond Transport EIR, pages 87-170.

PERMITS/COMPLIANCE

Construction of the Richmond Transport project would require permits from the NPS, California Coastal Commission, Bay Conservation and Development Commission, the Army Corps of Engineers, the Army at the Presidio California, the Secretary of the Interior, California Department of Health Services and the Department of Fish and Game.

DOCUMENT PREPARATION

This document was prepared by the San Francisco Clean Water Program in cooperation with the National Park Service. The following people contributed to the preparation of this document.

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This document was prepared in consultation with the Army at the Presidio, the Army Corp of Engineers, San Francisco Clean Water Program and Veterans Administration.

This project was discussed at the June 1991 Corps of Engineering interagency meeting which was attended by representatives USACE, NPS, U.S. Fish and Wildlife Service, Environmental Protection Agency, California Fish and Game and California State Lands Commission.

DOCUMENT INFORMATION

This document was prepared by the San Francisco Office under the direction of the Chief of the Office of the Attorney General. The document contains information that is confidential and its disclosure to the public would be contrary to the public interest.

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APPENDIX A

BACKGROUND

Overview

APPENDIX A

The City and County of San Francisco is currently served by a sewerage system in which the same system of lines is used to carry domestic, commercial, and industrial sewage together with rainfall runoff. During dry weather, the sewage is carried to the treatment plant in the City, where it is treated and discharged through outfalls along San Francisco Bay or along the Pacific Ocean. During wet weather, stormwater runoff enters during and after rainfall events flow in the sewerage system to exceed the system capacity. When this occurs, the sewage flow, comprised of untreated sewage and stormwater runoff, overflows through outfalls into San Francisco Bay and the Pacific Ocean at a number of locations along the city's shoreline.

In 1974, the City, State, and the U.S. Environmental Protection Agency adopted a wastewater management Master Plan¹ to upgrade the City's sewer system and treatment plants and to reduce the number and frequency of wastewater overflows. This Master Plan is being implemented in stages under the direction of the San Francisco Ocean Waste Program, and a number of corporations have been contacted or are currently under discussion with other governments who are still in the planning stages. Figure 1 depicts the initial Wastewater Master Plan and the names of the affected corporations.

¹City and County of San Francisco, 1974. Master Plan for Wastewater Management.

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CHAPTER 2

PROJECT DESCRIPTION

BACKGROUND

Overview

The City and County of San Francisco is currently served by a sewerage system in which the same system of pipes is used to carry domestic, commercial, and industrial sewage together with rainfall runoff. During dry weather, the sewage is carried to two treatment plants in the City, where it is treated and discharged through outfalls either along San Francisco Bay or along the Pacific Ocean. During wet weather, stormwater runoff produced during and after rainfall causes flow in the sewerage system to exceed the system capacity. When this occurs, the excess flow, comprised of untreated sewage and stormwater runoff, overflows through outfalls into San Francisco Bay and the Pacific Ocean at a number of locations along the City's shoreline.

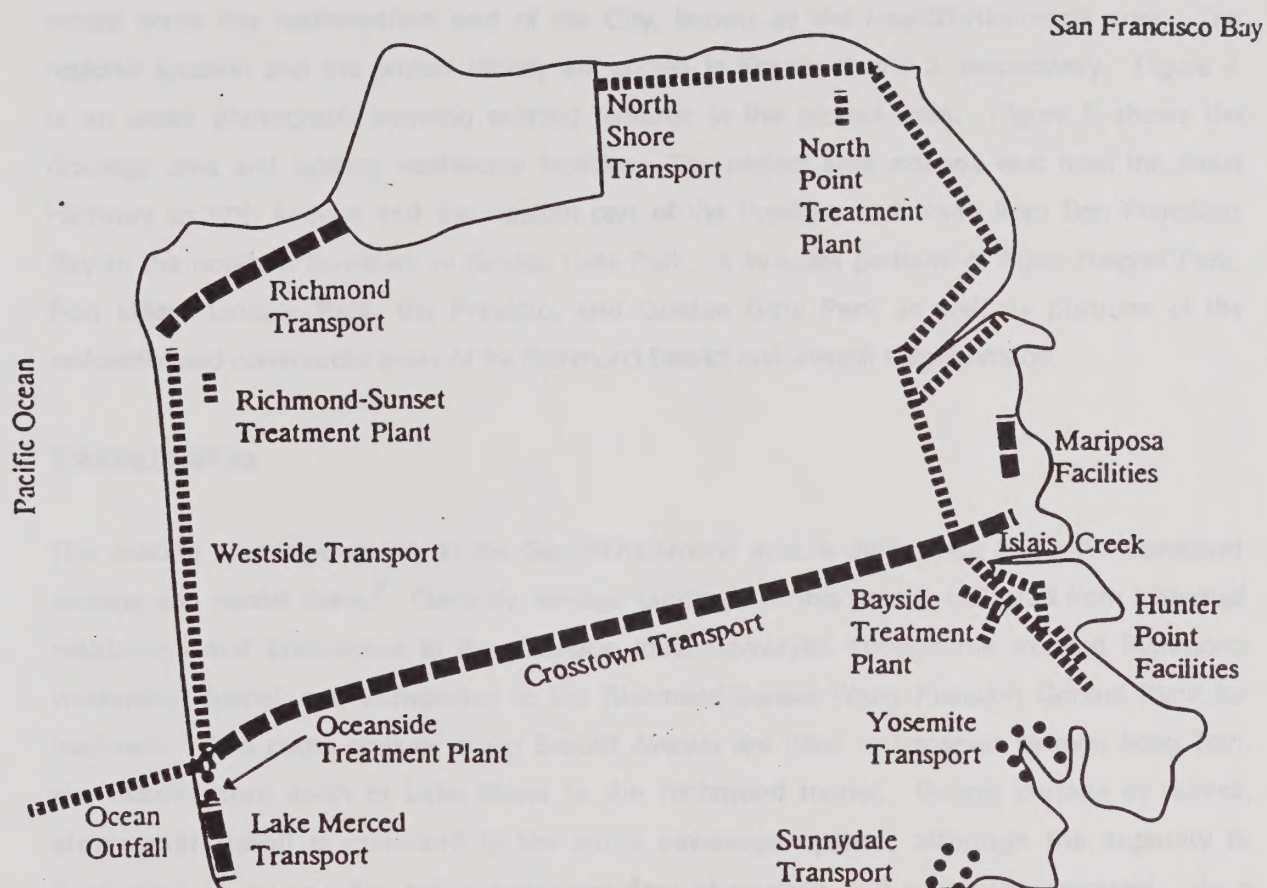
In 1974, the City, State, and the U.S. Environmental Protection Agency adopted a Wastewater Management Master Plan¹ to upgrade the City's sewer system and treatment plants and to reduce the number and frequency of wastewater overflows. This Master Plan is being implemented in stages under the direction of the San Francisco Clean Water Program, and a number of components have been completed or are currently under construction, while other components are still in the planning stages. Figure 1 depicts the overall Wastewater Master Plan and the status of the various components.

¹City and County of San Francisco, 1971. Master Plan for Wastewater Management.

WASTEWATER MASTER PLAN

Richmond Transport Project

FIGURE 1



Legend:

- Complete, Currently in Operation
- Under Construction
- In Planning or Design



Not to Scale

Project Location

This report addresses the Richmond Transport Project, one component of the Master Plan which would serve the northwestern part of the City, known as the Seacliff-Richmond area. The regional location and the project vicinity are shown in Figures 2 and 3, respectively. Figure 4 is an aerial photograph showing existing features in the project area. Figure 5 shows the drainage area and existing wastewater facilities. The project area extends east from the Great Highway to 17th Avenue and the western part of the Presidio, and south from San Francisco Bay to the northern boundary of Golden Gate Park. It includes portions of Sutro Heights Park, Fort Miley, Lincoln Park, the Presidio, and Golden Gate Park as well as portions of the residential and commercial areas of the Richmond District and Seacliff neighborhood.

Existing Facilities

The existing sewerage system in the Seacliff-Richmond area is inadequate to handle combined sewage and rainfall flows.² Currently, sewage produced in this area is collected from individual residences and businesses in the drainage area, conveyed through the existing Richmond wastewater tunnel, and transported to the Richmond-Sunset Water Pollution Control Plant for treatment. Two pump stations along Seacliff Avenue are used to transport sewage flows from the Seacliff area north of Lake Street to the Richmond tunnel. During periods of rainfall, stormwater runoff is collected in the same sewerage system, although the capacity is insufficient to convey the entire combined flow of sewage and runoff for treatment. As a result, the excess flow, which includes unknown quantities of untreated sewage, is discharged through four outfalls near Baker Beach and James D. Phelan Beach (China Beach) into San Francisco Bay, as shown on Figure 5. This occurs on an average of 40 times per year, in violation of federal and state requirements.

²Combined sewage, combined wastewater, or combined flow refers to the combination of sanitary sewage and rainfall runoff.

CHAPTER

The water supply for the city of London is derived from the River Thames and the River Great Ouse. The water is pumped from the River Thames at Teddington and the River Great Ouse at Hemel Hempstead. The water is then pumped to the city of London and distributed to the houses. The water is pumped from the River Thames at Teddington and the River Great Ouse at Hemel Hempstead. The water is then pumped to the city of London and distributed to the houses. The water is pumped from the River Thames at Teddington and the River Great Ouse at Hemel Hempstead. The water is then pumped to the city of London and distributed to the houses.

CHAPTER

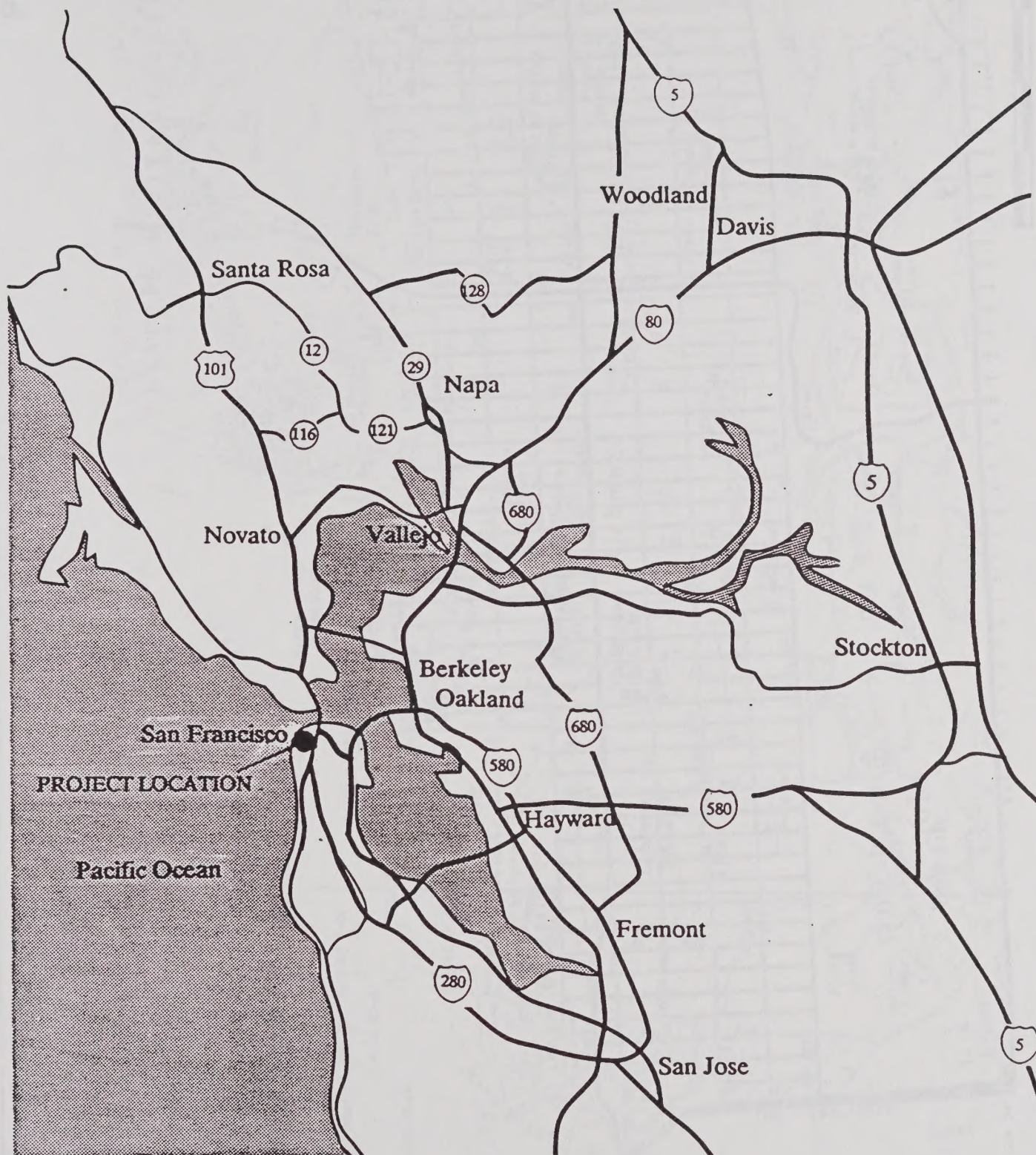
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REGIONAL LOCATION

Richmond Transport Project

FIGURE 2

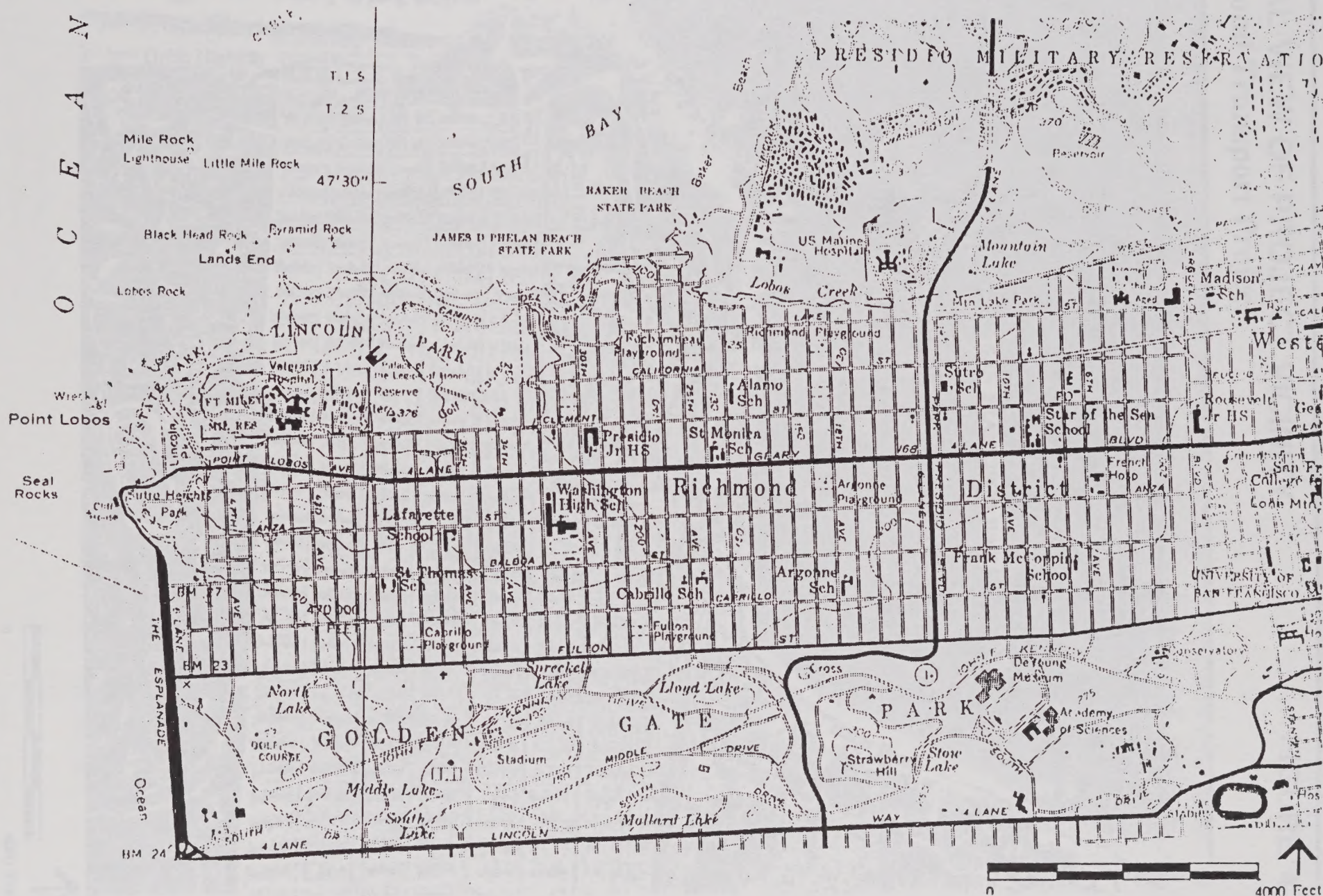




PROJECT VICINITY

Richmond Transport Project

FIGURE 3



YITHUVA TCELONG
PROJECT AREA



AERIAL VIEW OF PROJECT VICINITY

Richmond Transport Project

FIGURE 4



Source: Orion Environmental Associates, 1989.



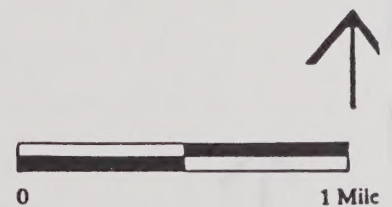
EXISTING FACILITIES AND DRAINAGE BOUNDARY Richmond Transport Project

FIGURE 5



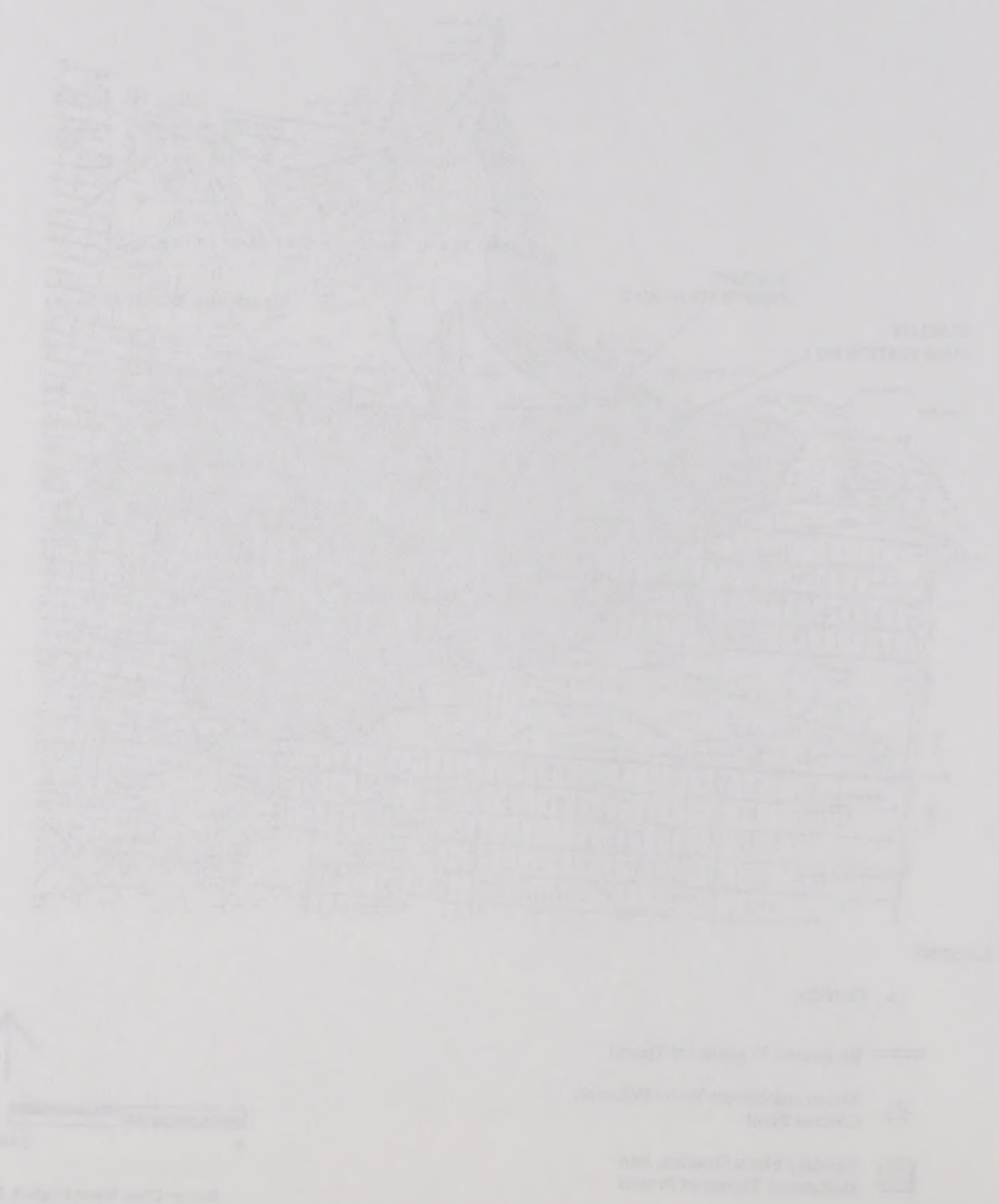
Legend:

- △ Outfalls
- == Richmond Wastewater Tunnel
- ☼ Richmond-Sunset Water Pollution Control Plant
- ▨ Sanitary Flows Draining into Richmond Transport Project



Source: Clean Water Program, 19

EXISTING FACILITIES AND DRAINAGE BOUNDARY Richmond Transport Project



EXISTING SEWERS

Richmond Transport Project

FIGURE 5A



△ OUTFALL

--- MAJOR SEWER INTERCEPTOR

APPROXIMATE SCALE 1" = 1000'

(Source: Clean Water Program, 1989)



1. 0.001

2. 0.001



3. 0.001

4. 0.001

Project Planning and Environmental Review

The Clean Water Program conducted preliminary studies of the Richmond Transport Project in 1980, but the project planning was interrupted due to funding limitations and re-established priorities. No apparent best alternative was selected at that time. The preliminary studies in 1980 included inspections of existing sewers along California and Lake streets as well as inspections in the Richmond wastewater tunnel; the studies determined these sewers to be in adequate condition for continued use.

Currently, the Richmond Transport Project is in the facilities planning phase, and the Clean Water Program has developed a number of alternative approaches to achieving the objectives of the proposed project. Based on input from the Richmond Advisory Committee and the Seacliff Properties Association, four alternatives are being considered during this phase. From these alternatives, an apparent best alternative will be selected for detailed design, based on environmental and public review. The selected alternative, if ultimately approved, is scheduled to begin construction in 1992 and be on-line in 1994.

The San Francisco Department of City Planning, Office of Environmental Review, has determined that the proposed Richmond Transport Project is subject to the requirements of the California Environmental Quality Act (CEQA). An Initial Study was completed in accordance with CEQA and was distributed to the public on September 9, 1988 (see Appendix A). On the basis of the Initial Study, the City has determined that an Environmental Impact Report (EIR) is required for the proposed project. The Initial Study provided a preliminary environmental assessment of the proposed project and identified the effects determined to be potentially significant as well as the effects determined to be insignificant. The Initial Study also served to focus the EIR on the effects determined to be potentially significant.

This EIR has been prepared in accordance with CEQA. It provides detailed analysis of the proposed project in the following areas: Land Use; Transportation, Circulation, and Parking; Noise (during construction only); Vibration (during construction only); Air Quality and Odors (during construction only); Geology; Water Quality; Energy; Hazards; Biotic Resources; and Cultural Resources. Similar to the Initial Study, four alternative projects are assessed at an

1.1 Introduction and Objectives

The first part of the report provides a brief overview of the project and its objectives. The project aims to develop a system that can automatically generate reports from data stored in a database. The system will be designed to be user-friendly and easy to use. The project will be completed within a specified time frame and budget. The report will provide a detailed description of the system and its components, as well as a discussion of the results of the project.

Chapter 2 describes the system architecture and the data sources used. The system is designed to be modular and scalable. It consists of a front-end user interface, a middle-tier application logic, and a back-end database. The data sources are the various databases and files that the system uses to store and retrieve data. The system is designed to be able to handle large amounts of data and to be able to perform complex queries and calculations.

Chapter 3 describes the implementation of the system. This chapter provides a detailed description of the code that was written to implement the system. It includes a discussion of the various algorithms and data structures that were used, as well as a description of the testing and debugging process. The chapter also includes a discussion of the performance of the system and the results of the user acceptance testing.

Chapter 4 provides a summary of the project and a discussion of the conclusions that were drawn. It also includes a list of references and a list of appendices. The appendices contain additional information that is relevant to the project, such as the source code and the test results. The report is intended to provide a comprehensive overview of the project and to serve as a reference for future work.

equal level of detail. An apparent best alternative will be selected following completion of the EIR based on environmental and public review.

The Initial Study identified some environmental effects which would either be insignificant or mitigated to levels of insignificance through measures incorporated into the project design. These require no further environmental analysis and will not be addressed in the EIR. Insignificant effects are briefly discussed as follows (See Appendix A for more details):

Visual Quality: Temporary (short-term) changes in views would occur under each alternative during construction; views would primarily be of trucks and construction equipment during the project construction period. For all alternatives, there would be no long-term or permanent changes in the existing visual quality of the project area.

Population: There would not be any increase in dry weather capacity of the wastewater system and therefore, no potential for inducing population growth.

Noise: No noise or vibration impacts would be associated with operation of the project.

Air Quality: No increases in local or regional levels of vehicular emissions would be associated with operation of the project.

Public Services/Utilities: The project would not result in an increased demand for public services such as fire and police protection, schools, or park facilities.

OBJECTIVES OF THE PROJECT SPONSOR

The objective of the Richmond Transport Project is to reduce the average annual number of wastewater overflows in the Seacliff-Richmond area from 40 to 8. The Richmond Transport Project would satisfy one component of the Wastewater Master Plan and must be compatible with other components of the plan.

This objective would satisfy the requirements of the California Regional Water Quality Control Board (RWQCB) to meet federal and state standards for discharge of pollutants and to reduce

impacts to the quality of receiving waters. The RWQCB has issued Order 88-105 which contains a time schedule for completion of the Richmond Transport Project. The schedule is as follows:

<u>Task</u>	<u>Date</u>
Complete environmental review	December 1989
Complete design	April 1991
Start construction	August 1992
Complete construction	September 1994
Begin operation	September 1994

The goal of the Clean Water Program is to meet this schedule and to comply with the requirements of CEQA, including public participation and review.

PROJECT ALTERNATIVES

The Clean Water Program has developed four project alternatives for detailed environmental review; these alternatives are denoted R-2, R-4(A), R-6, and R-6(B). Alternative R-1, which was originally under consideration, was dropped from consideration prior to publication of the Initial Study (see Appendix A, pages A.15 to A.16). Due to public concern and interest in Alternative R-1, Appendix B has been included in the EIR and provides a description of Alternative R-1 and copies of the correspondence which ultimately led to the decision to reject that alternative.

All of the alternatives would use portions of the existing system to varying degrees, modify or upgrade some portions, and construct new components in order to meet the project objectives. The project alternatives and modifications of the current system must be compatible with the other elements of the Westside System (see Figure 1, page 12), which includes the completed Westside Transport and the Oceanside Water Pollution Control Plant (currently under construction). Each alternative is described below.

It is the responsibility of the project manager to ensure that the project is completed on time, within budget, and to the satisfaction of the client. The project manager must also ensure that the project is completed in accordance with the project plan and that the project is completed in a professional and ethical manner.

Task	Duration
Project Initiation	1 week
Project Planning	2 weeks
Project Execution	4 weeks
Project Monitoring and Control	3 weeks
Project Closure	1 week

The goal of the project is to develop a new product that will be sold in the market. The project manager must ensure that the project is completed on time, within budget, and to the satisfaction of the client.

Project Management

The project manager is responsible for the overall management of the project. This includes the planning, execution, monitoring, and control of the project. The project manager must also ensure that the project is completed in accordance with the project plan and that the project is completed in a professional and ethical manner.

It is the responsibility of the project manager to ensure that the project is completed on time, within budget, and to the satisfaction of the client. The project manager must also ensure that the project is completed in accordance with the project plan and that the project is completed in a professional and ethical manner.

Alternative R-2

The major component of Alternative R-2 would consist of a wastewater tunnel, approximately 10,000 feet long, starting in the U. S. Army Presidio near Lincoln Boulevard at 22nd Avenue (ext.) and ending at the Great Highway near Anza Street (ext.).³ The tunnel route would pass beneath Lincoln Boulevard, El Camino Del Mar, private property, Lincoln Park, the Veterans Administration Medical Center, Fort Miley, and Sutro Heights Park, as shown in Figure 6. The tunnel would be about 13 feet in diameter, and the depth would range from 15 to 320 feet below the ground surface to the crown of the tunnel. With the exception of the western terminus, the entire tunnel would be underground with no visible structures.

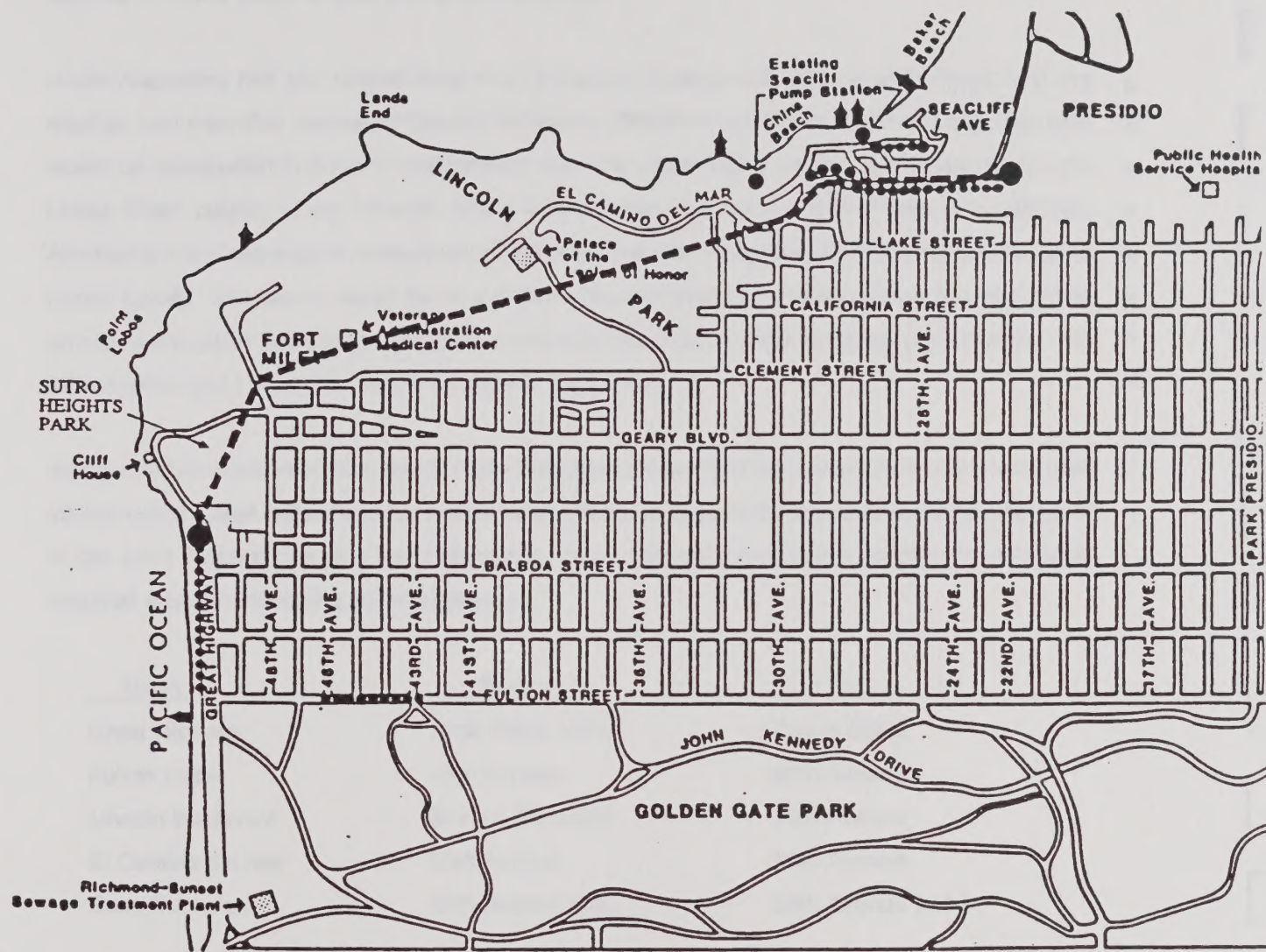
There are two variations of the location for the western terminus or portal of the tunnel: one in the currently vacant lot south of Sutro Heights Park between La Playa, Balboa, and the Great Highway; and a second in the roadway of the Great Highway directly southwest of Sutro Heights Park. At the first portal variation, there would be a permanent access structure for maintenance purposes, a maximum of 13-feet in diameter at the site, and a permanent retaining wall may be required on the slope above the tunnel portal near the Great Highway; the size and design of the access structure and retaining wall would be determined during the design phase of the project. At the second portal variation, there would be a maintenance structure below grade under the Great Highway. The top of that structure would consist of either a concrete or metal plate larger than a normal manhole, over which vehicles could pass.

As part of Alternative R-2, combined sewage flows in the Seacliff area would be stored in the existing six-foot diameter brick sewer which runs beneath 27th Avenue and private property between Seacliff Avenue and El Camino Del Mar; a new overflow structure would be constructed at the end of this sewer east of 27th Avenue. A new sewer would be constructed in Seacliff Avenue between 25th Avenue (ext.) and 26th Avenue (ext.). In addition, a new sewer would be constructed in El Camino Del Mar from 29th Avenue and along Lincoln Boulevard to the tunnel portal in the Presidio. By using the existing Seacliff Pump Station No. 2 and force main, the stored flows would be pumped to 25th Avenue and El Camino Del Mar,

³ext.: Indicates "extension" or the location where a specified roadway would be if the existing alignment were extended beyond its terminus.

ALTERNATIVE R-2 Richmond Transport Project

FIGURE 6



Legend:

- New Street Sewers
- New Tunnel
- Tunnel Portal
- ↑ Existing Outfall
- Existing Pump Station

(Symbols used in Figure are intended to show location of project components: they are not representative of size or scale.)

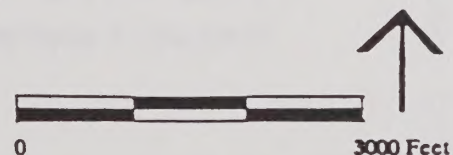


FIGURE 1

ALTERNATIVE R-2 Richmond Transport Project



Legend:

- 1. Project Area
- 2. Major Road
- 3. Minor Road
- 4. Waterway
- 5. Other

Scale: 1 inch = 1 mile
North Arrow

and into the proposed tunnel. The dry weather flows from Seacliff Pump Station No. 1 would be diverted to a new sewer at 29th and Seacliff avenues.

Under Alternative R-2, the 12-inch force main in Lincoln Boulevard would be abandoned, and dry weather flow from 29th Avenue/El Camino del Mar to 25th Avenue/Lincoln Boulevard drainage area would be transported through a new 5.25-foot diameter sewer along Lincoln Boulevard, across the Lobos Creek culvert, to the Presidio, where it would enter the proposed R-2 tunnel. In addition, Alternative R-2 would require replacement of the sewer line extending from 22nd Avenue and crossing Lobos Creek. This sewer would be at a higher elevation than the existing sewer line and would convey wet weather flows to the proposed overflow structure to connect to the proposed tunnel. The 17th Avenue (ext.) sewer line would connect to the tunnel.

Alternative R-2 would require a new 220-foot long partly above-ground sewer line to be constructed across Lobos Creek in the Presidio north of 22nd Avenue to replace the existing above-ground sewer at the same location (but at a lower elevation). In all, cut-and-cover sewer construction would be required along the following street segments:

<u>Along</u>	<u>From</u>	<u>To</u>
Great Highway	Anza Street (ext.)	Fulton Street
Fulton Street	43rd Avenue	46th Avenue
Lincoln Boulevard	Bowley (Presidio)	25th Avenue
El Camino del Mar	25th Avenue	29th Avenue
Seacliff Avenue	25th Avenue (ext.)	26th Avenue (ext.)

Alternative R-4(A)

This alternative would require a wastewater tunnel, approximately 12,000 feet long, beginning at the 17th Avenue/Lake Street intersection and ending at the Great Highway near Anza Street (ext.). The tunnel route would pass beneath Lake Street, private property, Lincoln Park, the Veterans Administration Medical Center, Fort Miley, and Sutro Heights Park, as shown in Figure 7. The tunnel

would be about 12 feet in diameter, and the depth would range from 15 to 320 feet below ground surface to the crown of the tunnel. With the exception of the western terminus, the entire tunnel would be underground with no visible structures. Alternative R-4(A) would have the same two portal variations of the location for the western terminus as described above under Alternative R-2.

In the Seacliff area, Alternative R-4(A) would include construction of a new storage basin at the vacant lot adjacent to Seacliff Pump Station No. 2 and enlargement of this pump station's capacity through installation of a new pump. The storage basin would be approximately 16.7 feet wide, 22.4 feet deep, and 117 feet long. The contents of the storage basin would be



Legend:

- 100' New Street Sinks
- 50' New Sewer Main
- 100' New Tunnel
- 100' Tunnel Portal
- 100' Drop Shaft
- 100' Existing Outfall
- 100' Existing Power Station

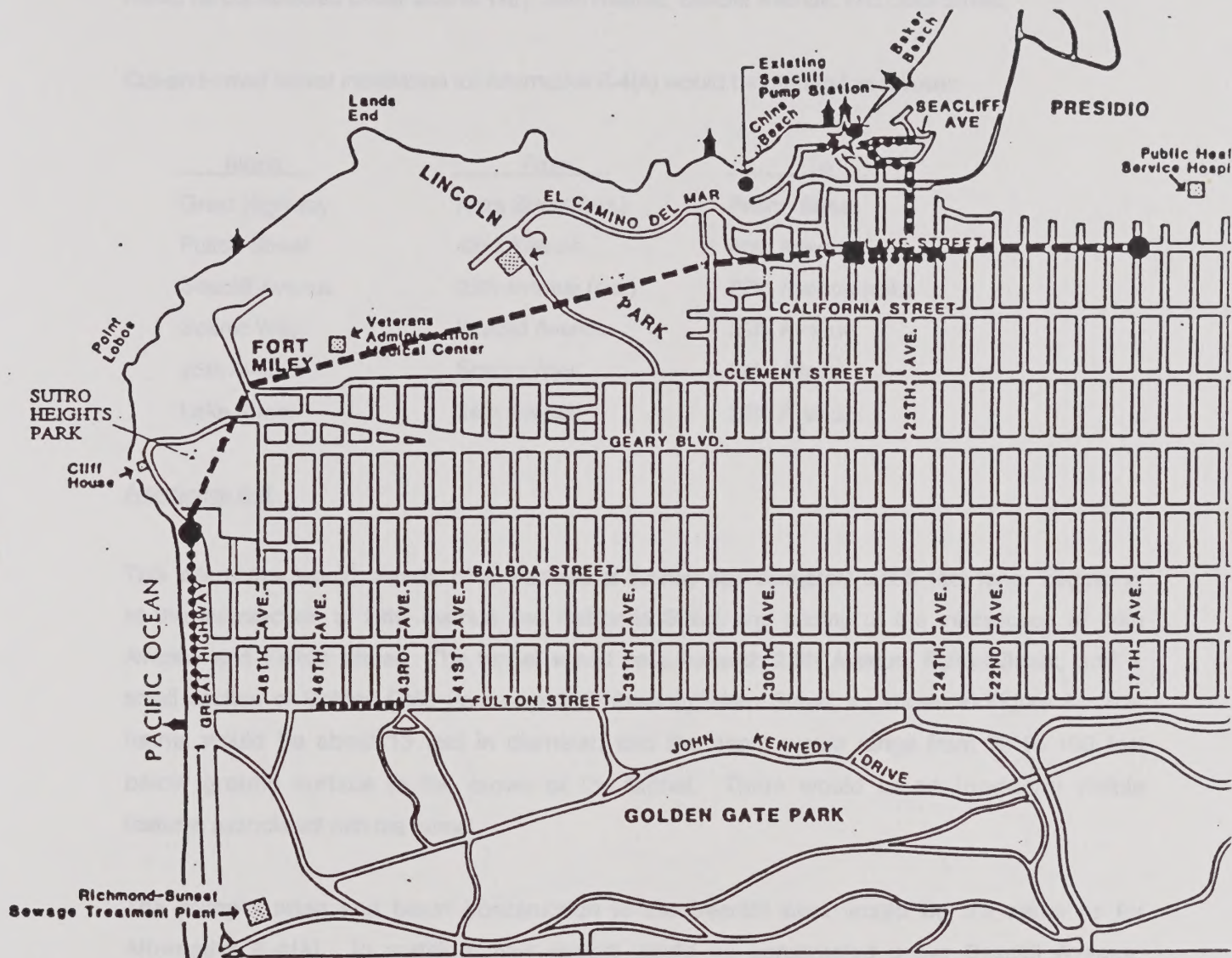
Legend symbols are provided to show location of project components. They are not to scale.

From the time it was first published, the book has been a best-seller. It has been translated into many languages and has been read by millions of people. The book is a classic of modern literature and is a must-read for anyone interested in the human condition.

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ALTERNATIVE R-4(A) Richmond Transport Project

FIGURE 7



Legend:

- New Street Sewers
- ☆ New Retention Basin
- New Tunnel
- Tunnel Portal
- Drop Shaft
- ↑ Existing Outfall
- Existing Pump Station

(Symbols used in Figure are intended to show location of project components: they are not representative of size or scale.)

0 3000 Feet

FIGURE 7

ALTERNATIVE R-4(A) Richmond Transport Project



Scale: 1 inch = 1 mile

Legend: Symbols used to identify project features and land use designations.

- Water
- Richmond
- Project Area
- Land Use Designation
- Transportation
- Other

pumped to 25th Avenue and Lake Street and into the proposed tunnel. In addition, new sewers would be constructed under Scenic Way, 25th Avenue, Seacliff Avenue, and Lake Street.

Cut-and-cover sewer installation for Alternative R-4(A) would be required as follows:

<u>Along</u>	<u>From</u>	<u>To</u>
Great Highway	Anza Street (ext.)	Fulton Street
Fulton Street	43rd Avenue	46th Avenue
Seacliff Avenue	25th Avenue (ext.)	27th Avenue (ext.)
Scenic Way	Seacliff Avenue	25th Avenue
25th Avenue	Scenic Way	Lake Street
Lake Street	24th Avenue	27th Avenue

Alternative R-6

This alternative would consist of a wastewater tunnel, approximately 9,000 feet long, beginning at the intersection of 24th Avenue and California Street and ending at the intersection of 40th Avenue and Fulton Street. The tunnel would pass beneath 24th Avenue, Fulton Street, and a small section of Golden Gate Park near 24th Avenue/Fulton Street, as shown in Figure 8. The tunnel would be about 13 feet in diameter, and the depth would range from 28 to 100 feet below ground surface to the crown of the tunnel. There would be no long-term visible features associated with the tunnel.

The pump station and basin construction in the Seacliff area would be the same as for Alternative R-4(A). In addition, new sewers would be constructed under Seacliff Avenue, Scenic Way, 25th Avenue, and Lake Street.

Geography is the study of the Earth and its features. It is a science that seeks to understand the physical and human environment and how they interact. Geography is a multidisciplinary field that draws on a variety of disciplines, including biology, chemistry, physics, and social sciences.

Geography is a science that seeks to understand the physical and human environment and how they interact.

Physical Geography	Human Geography	Environmental Geography
Landforms	Population	Climate
Water	Urbanization	Soil
Vegetation	Migration	Biogeography
Wildlife	Development	Conservation
Geology	Infrastructure	Resource Management
Atmosphere	Transportation	Environmental Policy
Oceans	Communication	Environmental Law
Coastal	Information Technology	Environmental Education
Marine	Globalization	Environmental Justice

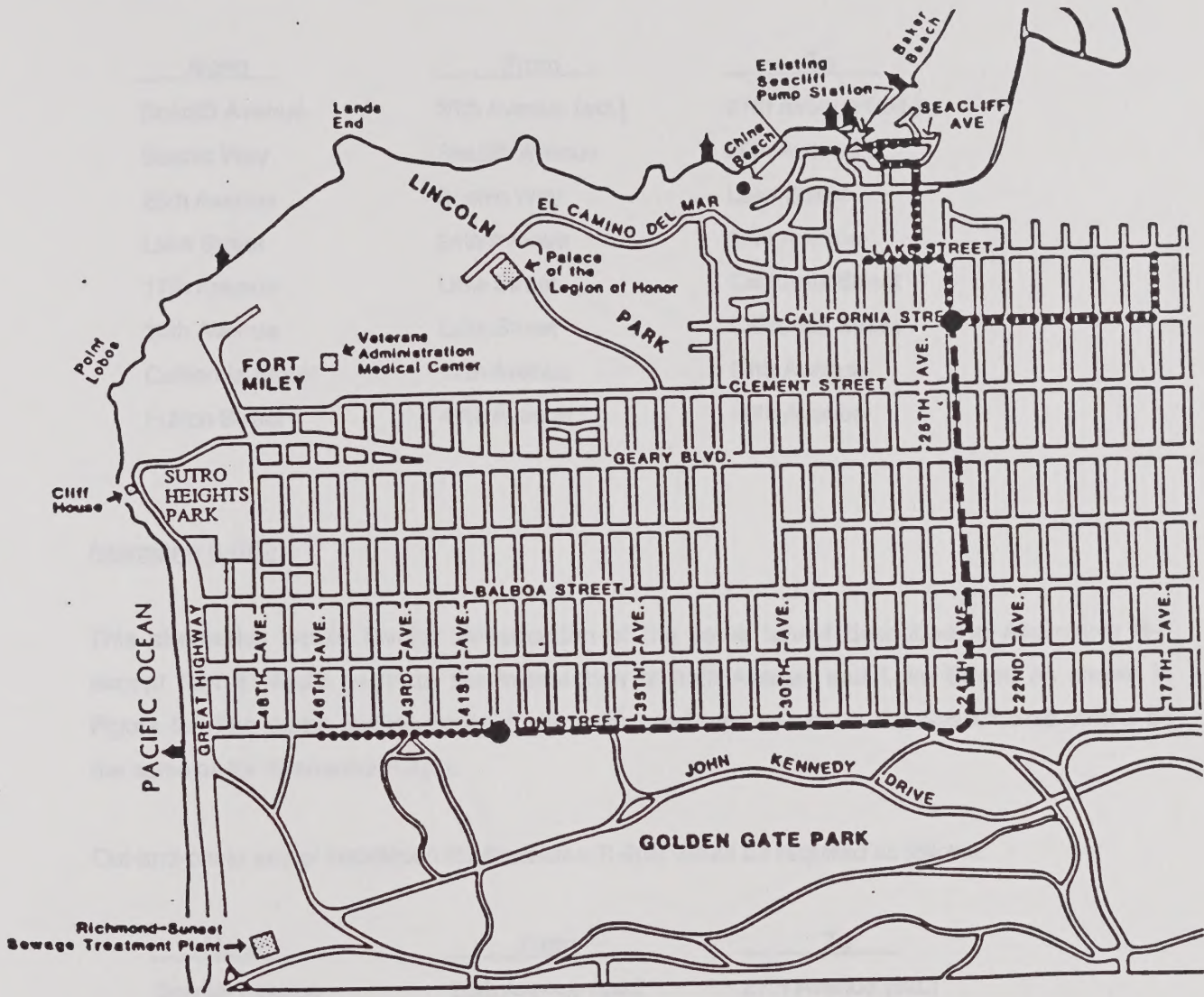
Geography and the Environment

The relationship between geography and the environment is a complex one. Geography is a science that seeks to understand the physical and human environment and how they interact. The environment is a complex system of physical and human factors that interact with each other. Geography is a multidisciplinary field that draws on a variety of disciplines, including biology, chemistry, physics, and social sciences. The environment is a complex system of physical and human factors that interact with each other. Geography is a multidisciplinary field that draws on a variety of disciplines, including biology, chemistry, physics, and social sciences.

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FIGURE 8

ALTERNATIVE R-6 Richmond Transport Project



Legend:

- New Street Sewers
- ☆ New Retention Basin
- - - New Tunnel
- Tunnel Portal
- ↑ Existing Outfall

(Symbols used in Figure are intended to show location of project components: they are not representative of size or scale.)





Legend:

- ★ New Transit Station
- ☆ New Transit Station
- New Transit Line
- Transit Station
- Existing Transit Line

Legend:
— New Transit Line
— Existing Transit Line
— New Transit Station



Scale: 1 inch = 1 mile

Cut-and-cover sewer installation for Alternative R-6 would be required as follows:

<u>Along</u>	<u>From</u>	<u>To</u>
Seacliff Avenue	25th Avenue (ext.)	27th Avenue (ext.)
Scenic Way	Seacliff Avenue	25th Avenue
25th Avenue	Scenic Way	Lake Street
Lake Street	24th Avenue	27th Avenue
17th Avenue	Lake Street	California Street
24th Avenue	Lake Street	California Street
California Street	17th Avenue	24th Avenue
Fulton Street	40th Avenue	46th Avenue

Alternative R-6(B)

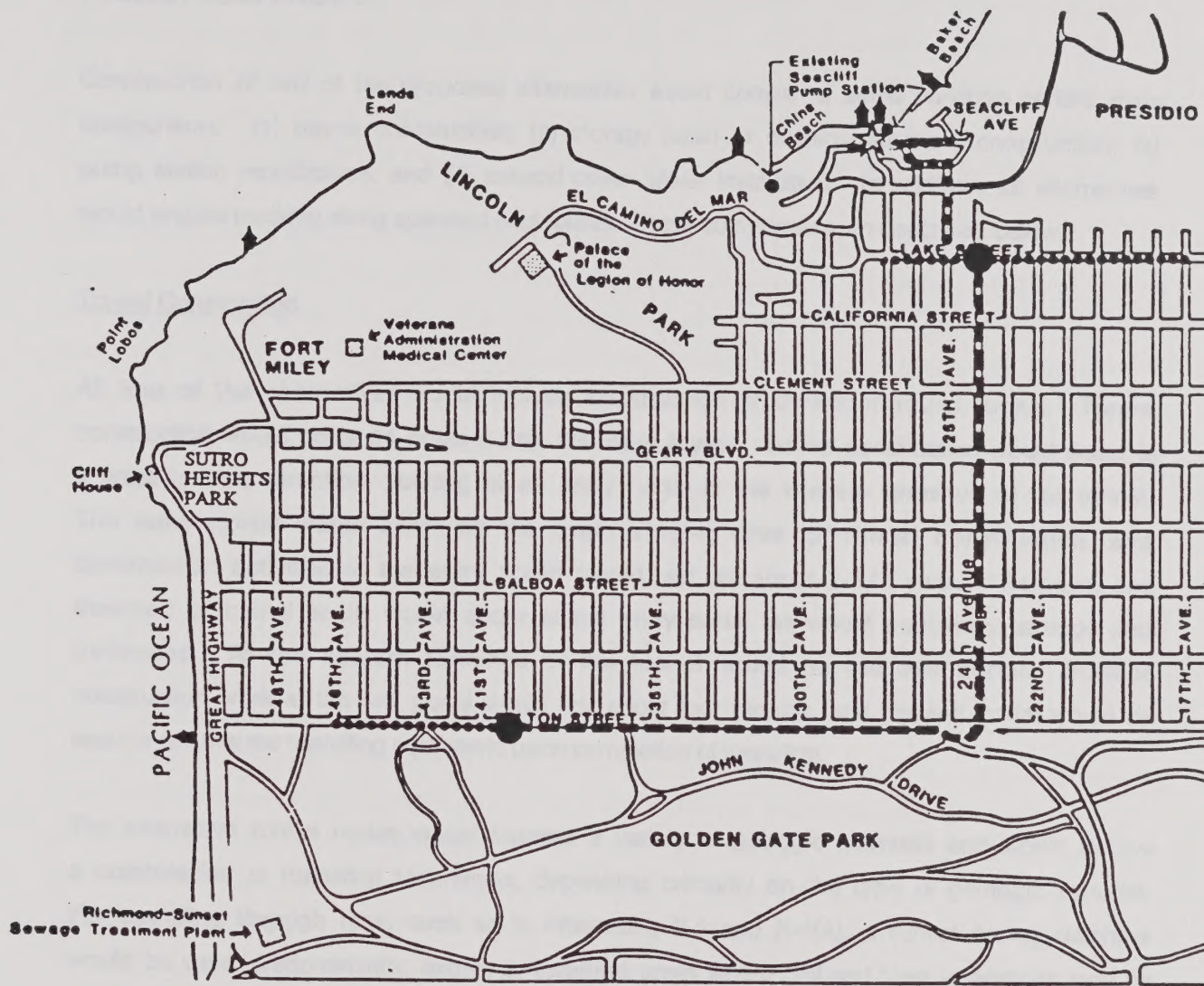
This alternative would involve construction of the same tunnel described in Alternative R-6 except that it would begin at the intersection of 24th Avenue and Lake Street, as shown in Figure 9. The pump station, basin construction, and new sewers in the Seacliff area would be the same as for Alternative R-4(A).

Cut-and-cover sewer installation for Alternative R-6(B) would be required as follows:

<u>Along</u>	<u>From</u>	<u>To</u>
Seacliff Avenue	25th Avenue (ext.)	27th Avenue (ext.)
Scenic Way	Seacliff Avenue	25th Avenue
25th Avenue	Scenic Way	Lake Street
Lake Street	17th Avenue	27th Avenue
Fulton Street	40th Avenue	46th Avenue

ALTERNATIVE R-6(B) Richmond Transport Project

FIGURE 9



Legend:

- New Street Sewers
- ☆ New Retention Basin
- - - New Tunnel
- Tunnel Portal
- ↑ Existing Outfall

(Symbols used in Figure are intended to show location of project components: they are not representative of size or scale.)



FIGURE 2

ALTERNATIVE R-1(B) Richmond Transport Project



Legend

- Major Thoroughfare
- Local Street
- Project Boundary
- Landmark
- Waterway



Richmond Transport Project
Map of the project area showing streets, landmarks, and project boundaries.

PROJECT COMPONENTS

Construction of any of the proposed alternatives would consist of some variation of four main components: (1) tunnel construction; (2) storage basin or overflow structure construction; (3) pump station modification; and (4) cut-and-cover sewer installation. In addition, all alternatives would require trucking along specified haul routes. These components are described below.

Tunnel Construction

All four of the alternatives would include construction of an underground tunnel. Tunnel construction would occur 24 hours a day, 365 days a year. Tunnel construction would occur in a west to east direction, starting at an entry portal at the western terminus of the tunnel. The entry portal would serve as the major staging area for tunnel construction, and construction activities at the entry portal would last for about 2-1/2 years. Removal and transport of tunnel spoils would occur at the entry portal, as would equipment storage and deliveries. At the eastern terminus of the tunnel would be the exit portal. Surface construction work at the exit portal would last about four months, and the exit portal would be used to remove the tunneling equipment upon completion of tunneling.

The alternative tunnel routes would traverse a variety of geologic materials and would involve a combination of tunneling techniques, depending primarily on the type of geologic material. For tunneling through rock, such as in Alternative R-2 and R-4(A), a tunnel boring machine would be used predominantly, except in localized areas where drill-and-blast operations may be needed for greywacke⁴ or harder materials.⁵ Drill-and-blast operations would be avoided to the maximum extent possible due to the urban nature of the project area, the cost, and the

⁴A sedimentary rock of the Franciscan Assemblage.

⁵Personal communication with Li Boccia, Contract Manager, Richmond Transport Project, Clean Water Program, December 1988.

PROJECT DESCRIPTION

Description of any of the proposed activities, work, or other efforts to be carried out under the project. The project description should include a clear statement of the project's purpose, objectives, and expected outcomes. It should also describe the project's scope, including the geographic area, the time period, and the resources that will be used. The project description should be written in a clear, concise, and professional manner, and it should be easy to read and understand.

Project Description

The first of the proposed activities is the construction of a new building. This building will be used as a community center and will provide a place for people to gather, socialize, and participate in various activities. The building will be located in the center of the town and will be a two-story structure. It will have a large open area on the ground floor that can be used for various purposes, such as a dance hall, a meeting room, or a place for people to sit and talk. The second floor will be used for storage and for other purposes. The building will be constructed using local materials and will be designed to be energy-efficient and environmentally friendly. The second activity is the construction of a new road. This road will be used to connect the town to the surrounding areas and will provide a more direct route for travel. The road will be located on the east side of the town and will be a two-lane road. It will be constructed using local materials and will be designed to be durable and safe. The third activity is the construction of a new school. This school will be used to provide education for the children of the town and will provide a place for them to learn and grow. The school will be located in the center of the town and will be a one-story structure. It will have a large classroom and a smaller room for the teacher. The school will be constructed using local materials and will be designed to be safe and secure.

The fourth activity is the construction of a new bridge. This bridge will be used to connect the town to the surrounding areas and will provide a more direct route for travel. The bridge will be located on the north side of the town and will be a two-lane bridge. It will be constructed using local materials and will be designed to be durable and safe. The fifth activity is the construction of a new park. This park will be used to provide a place for people to relax and enjoy the outdoors. The park will be located in the center of the town and will have a large open area for people to sit and talk. It will also have a playground for children and a place for people to play sports. The park will be constructed using local materials and will be designed to be safe and secure.

It is anticipated that the project will be completed by the end of the year.

The project is expected to have a positive impact on the community and will provide a place for people to gather, socialize, and participate in various activities. It will also provide a more direct route for travel and will provide a place for people to relax and enjoy the outdoors.

availability of the more versatile and reliable tunnel boring machine.⁶ For tunneling through soft ground, such as in sands and soils in Alternatives R-6 and R-6(B), a shield tunneling method is usually used in which a protective shield is inserted in the work space within the soil and to allow for excavation. The proposed shield tunneling method for Alternatives R-6 and R-6(B) is the earth pressure balance shield, where the space in front of the bulkhead is filled with soil under pressure.⁷

As described above, the tunnels proposed in Alternatives R-2 and R-4(A) would likely be constructed using a tunnel boring machine and/or limited drill and blast operations. Tunnel construction would advance from west to east starting at one of two possible entry portal locations at the Great Highway near Sutro Heights Park, as shown in Figure 10. One possible location is the currently vacant lot south of Sutro Heights Park between La Playa, Balboa, and the Great Highway, and the other possible location is within the roadway area of the Great Highway directly southwest of Sutro Heights Park. The entry portal would include a 30-foot by 50-foot tunnel shaft surrounded by a construction zone/staging area for tunnel construction during the 2-1/2 year construction period. Figure 10 also depicts the proposed construction zones and staging areas.

The tunnel exit portal for Alternative R-2 would be located in currently vacant land in the Presidio at the site of a proposed overflow/diversion structure east of Lincoln Boulevard near 22nd Avenue (ext.). This is open space land, adjacent to Lobos Creek within the boundaries of the GGNRA, on land managed by the Presidio. GGNRA uses a portion of this site to provide overflow parking for visitors on days when Baker Beach parking lots are filled. The exit portal would require a construction area about 25 feet by 100 feet. The exit portal for Alternative R-4(A) would be located at the intersection of 17th Avenue and Lake Street, requiring a 25-foot diameter tunnel shaft with about an 8,000-square-foot construction area; the construction area would be 25 feet wide and would extend 170 feet along Lake Street and 105 feet along 17th Avenue, as shown in Figure 11. Alternative R-4(A) would also include a 25-foot diameter drop shaft at the Lake Street/27th Avenue intersection where surface construction activities would last about two months. This drop shaft would connect an existing sewer main (located at a higher elevation) with the proposed tunnel; the surface construction

⁶Parsons Brinckerhoff Quade & Douglas, Inc. 1987. Preliminary Constructibility and Cost Analysis, Richmond and Lake Merced Wastewater Tunnels. Prepared for the City and County of San Francisco, Clean Water Program.

⁷Parsons Brinckerhoff Quade & Douglas, Inc. 1987.

The purpose of this study is to determine the effectiveness of the proposed project in reducing the number of accidents on the highway. The study will be conducted in two phases. The first phase will be a literature review to determine the current state of knowledge on the subject. The second phase will be a field study to determine the effectiveness of the proposed project in reducing the number of accidents on the highway.

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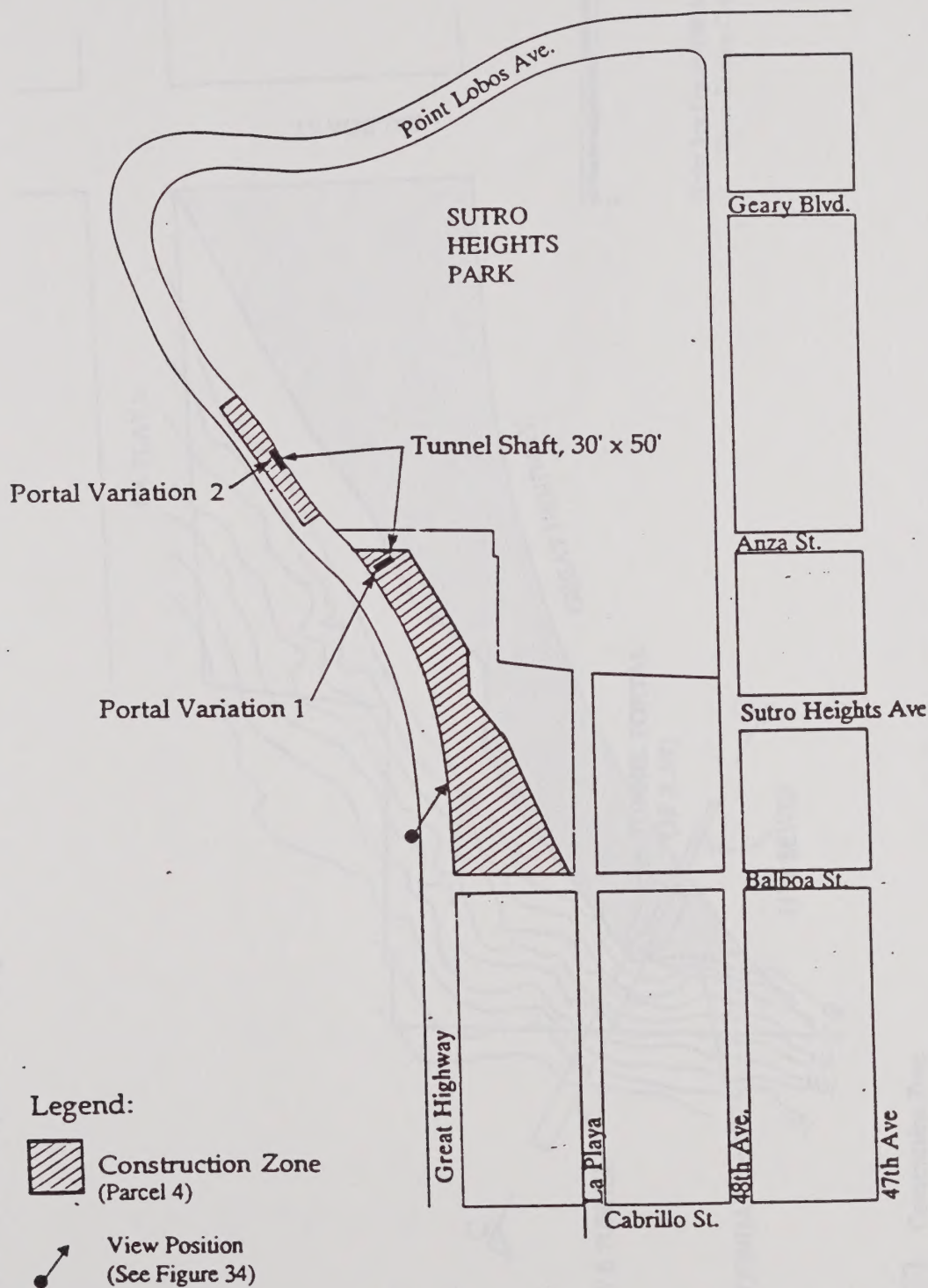
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CONSTRUCTION ZONE FOR ALTERNATIVES R-2 AND R-4(A) TUNNEL ENTRY PORTAL Richmond Transport Project

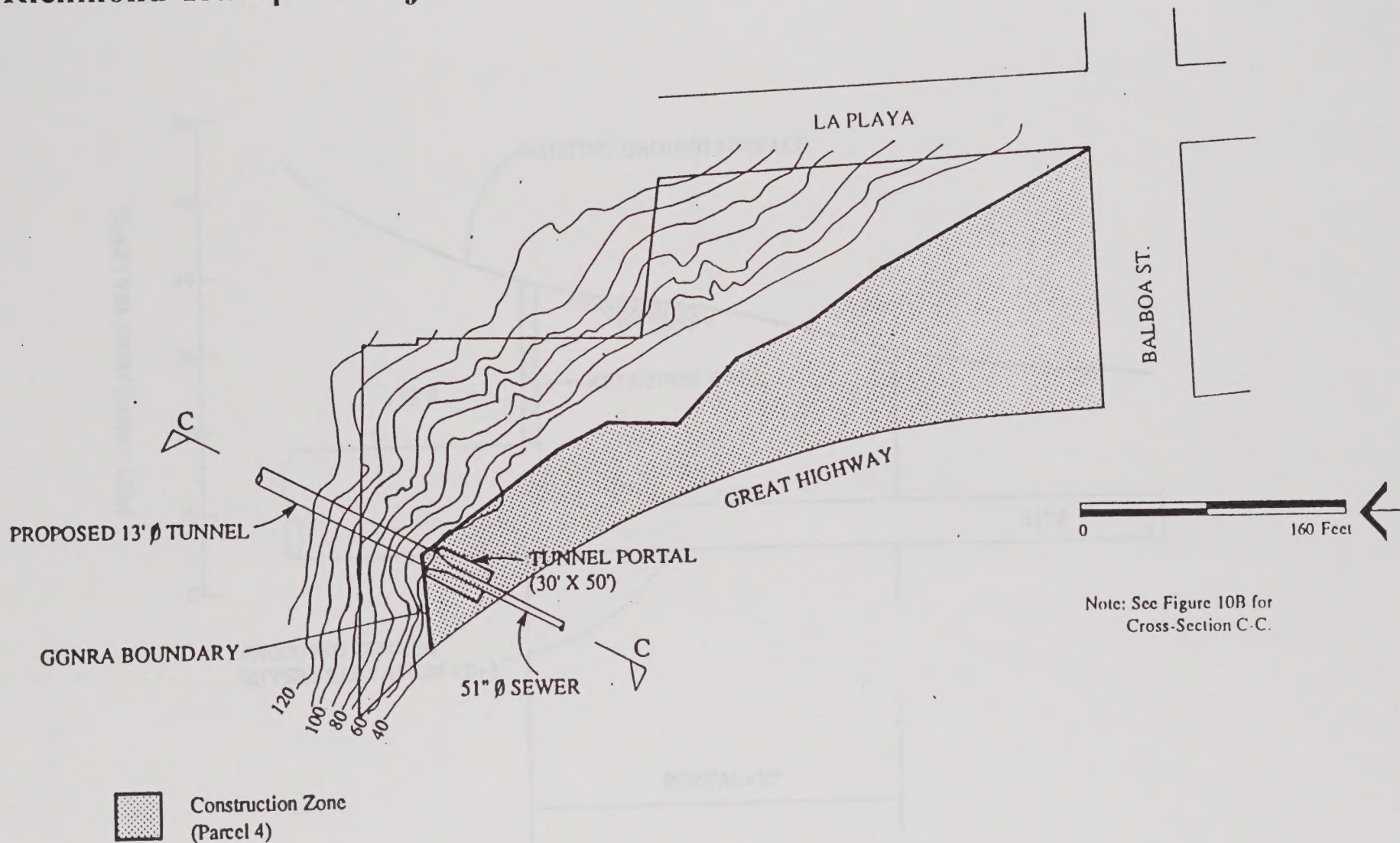
FIGURE 10*



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ALTERNATIVES R-2 AND R-4 (A), TUNNEL PORTAL VARIATION 1 Richmond Transport Project

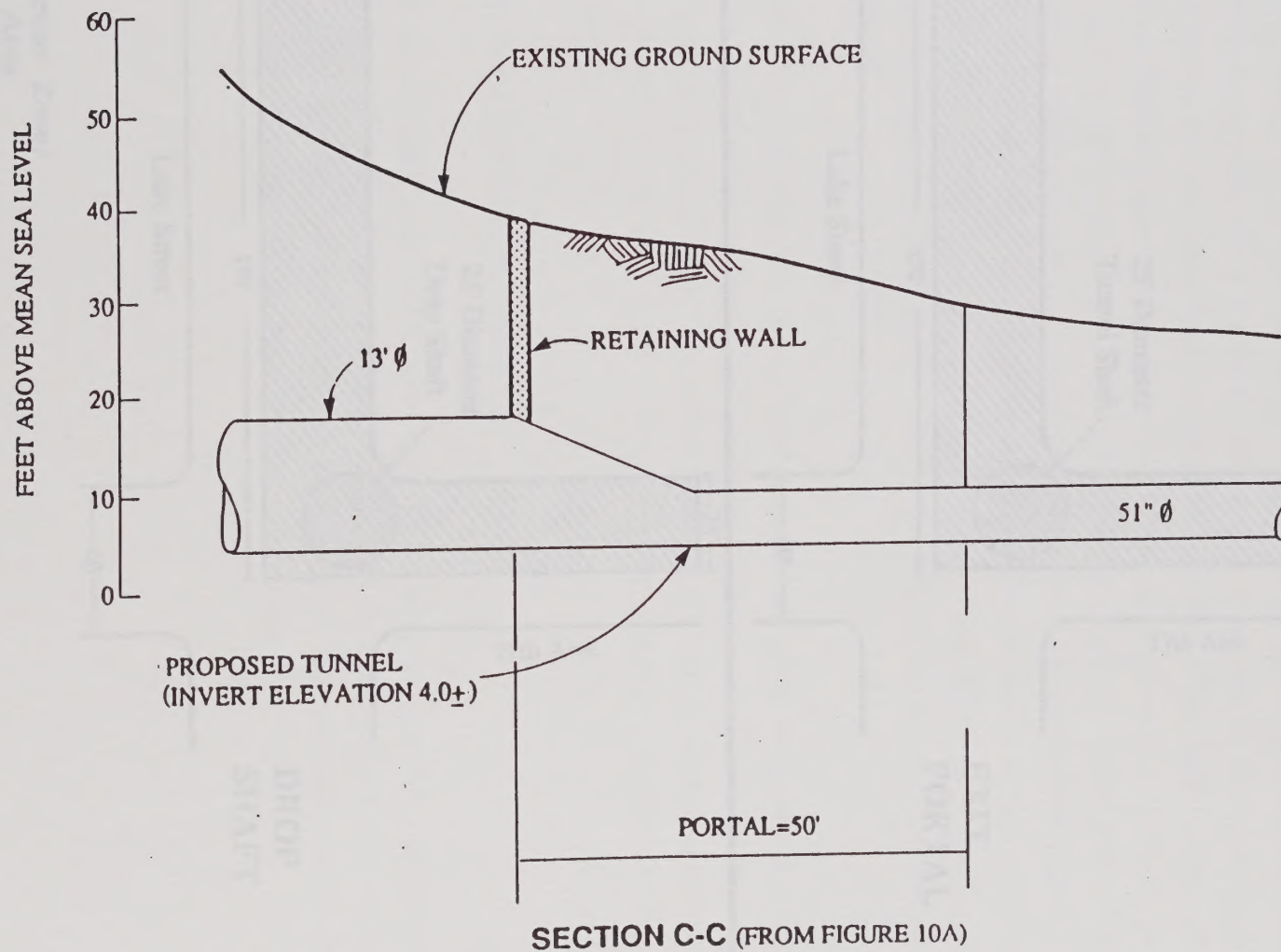
FIGURE 10A



PROFILE OF TUNNEL PORTAL VARIATION 1

Richmond Transport Project

FIGURE 10B

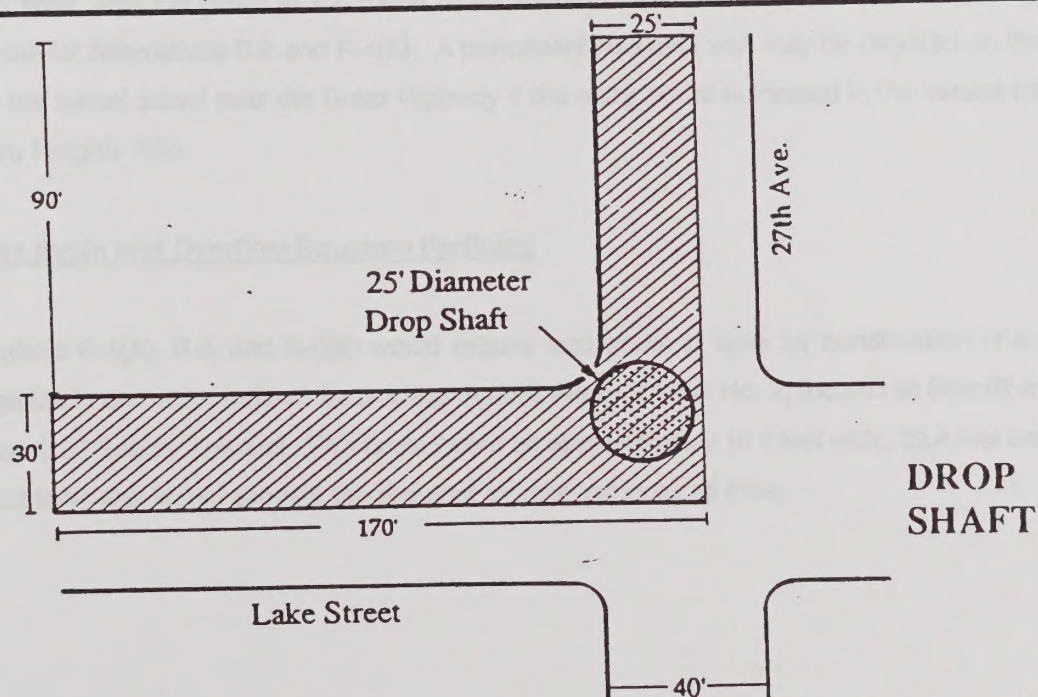
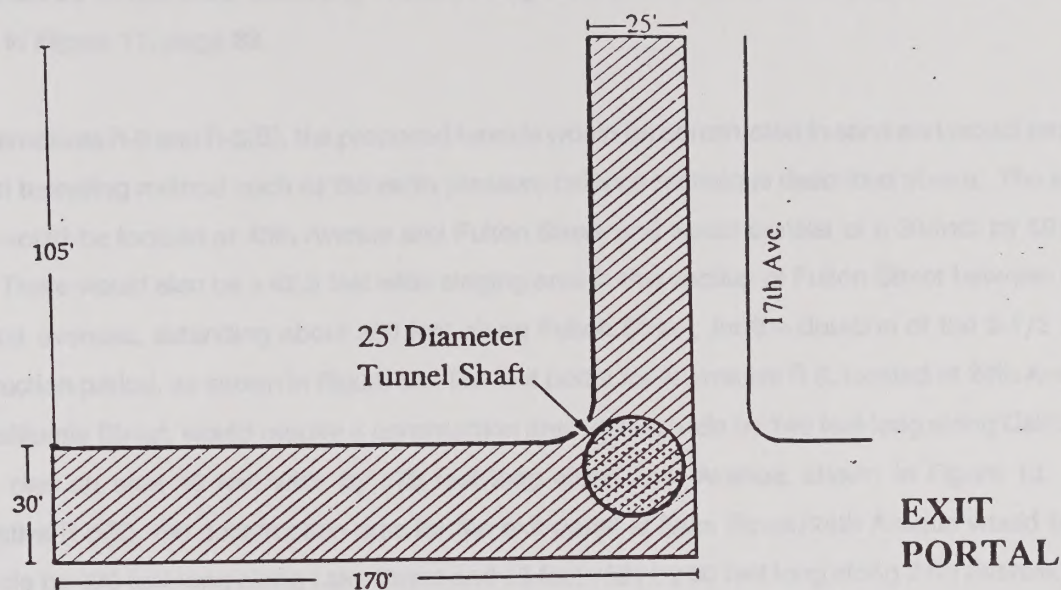


1. VOLTAGE AND CURRENT DISTRIBUTION IN A CABLE



CONSTRUCTION ZONE FOR ALTERNATIVE R-4(A) TUNNEL DROP SHAFT AND EXIT PORTAL Richmond Transport Project

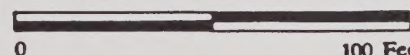
FIGURE 11*



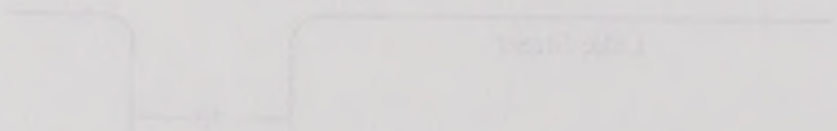
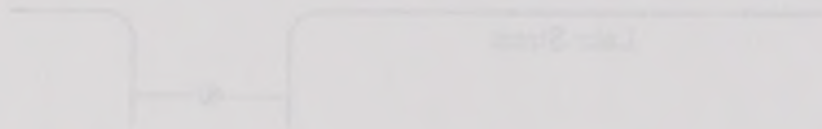
Legend:



Construction Zone/
Staging Area



CONSTRUCTION ZONE FOR ALTERNATIVE R-4(A) TUNNEL DROP SHAFT AND EXIT PORTAL Richmond Transport Project



Legend
Construction Zone
Tunnel Drop



area would be 30 feet wide, extending 170 feet along Lake Street and 90 feet along 27th Avenue, also shown in Figure 11, page 32.

For Alternatives R-6 and R-6(B), the proposed tunnels would be constructed in sand and would require a shield tunneling method such as the earth pressure balance technique described above. The entry portal would be located at 40th Avenue and Fulton Street and would consist of a 30-foot by 50-foot shaft. There would also be a 42.5 feet wide staging area in this section of Fulton Street between 40th and 41st avenues, extending about 350 feet along Fulton Street, for the duration of the 2-1/2 year construction period, as shown in Figure 12. The exit portal for Alternative R-6, located at 24th Avenue and California Street, would require a construction area 30 feet wide by 140 feet long along California Street plus an area 40 feet wide by 170 feet long along 24th Avenue, shown in Figure 13. For Alternative R-6(B), the construction area for the exit portal at Lake Street/24th Avenue would be 30 feet wide by 230 feet long along Lake Street and 15 feet wide by 50 feet long along 24th Avenue, also shown in Figure 13.

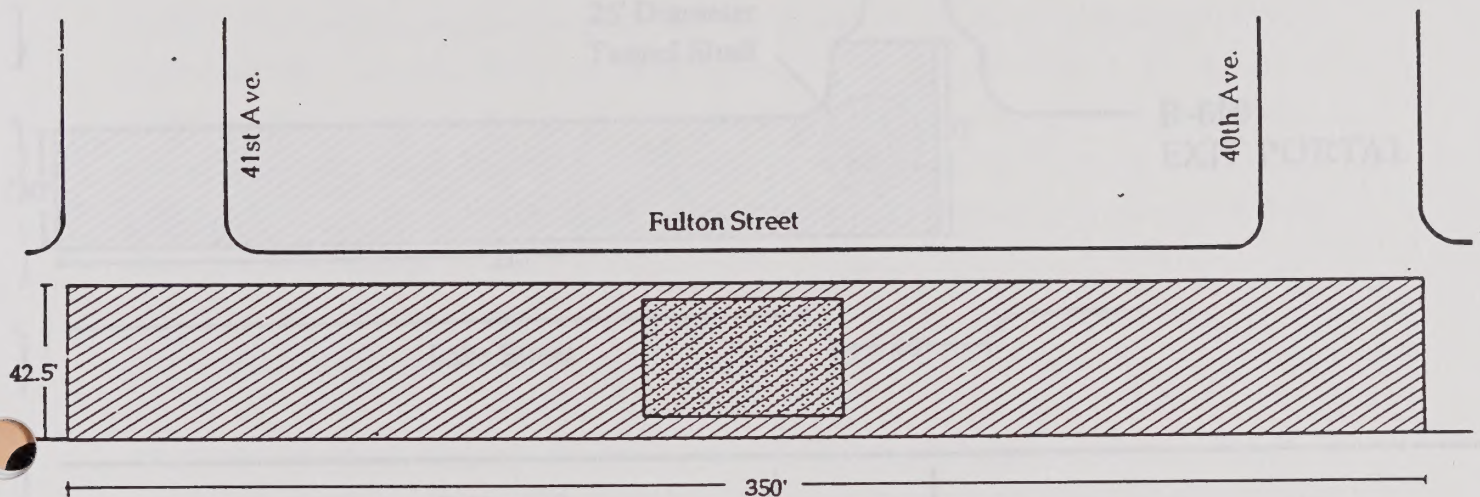
Upon completion of construction, none of the tunnel or construction portals would be visible from ground level, with the possible exception of a maintenance structure at the Great Highway portal variations for Alternatives R-2 and R-4(A). A permanent retaining wall may be required on the slope above the tunnel portal near the Great Highway if the entry portal is located in the vacant lot south of Sutro Heights Park.

Storage Basin and Overflow Structure Facilities

Alternatives R-4(A), R-6, and R-6(B) would require excavation of soils for construction of a Seacliff storage basin on the lot behind the existing Seacliff Pump Station No. 2, located at Seacliff and 26th avenues (100 Seacliff Avenue). This basin would be approximately 16.7 feet wide, 22.4 feet deep, and 117 feet long and would provide the required storage capacity to meet

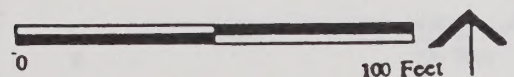
CONSTRUCTION ZONE FOR
ALTERNATIVES R-6 AND R-6(B)
TUNNEL ENTRY PORTAL
Richmond Transport Project

FIGURE 12



Legend:

-  Construction Zone/
Staging Area
-  Tunnel Shaft, 30' x 50'

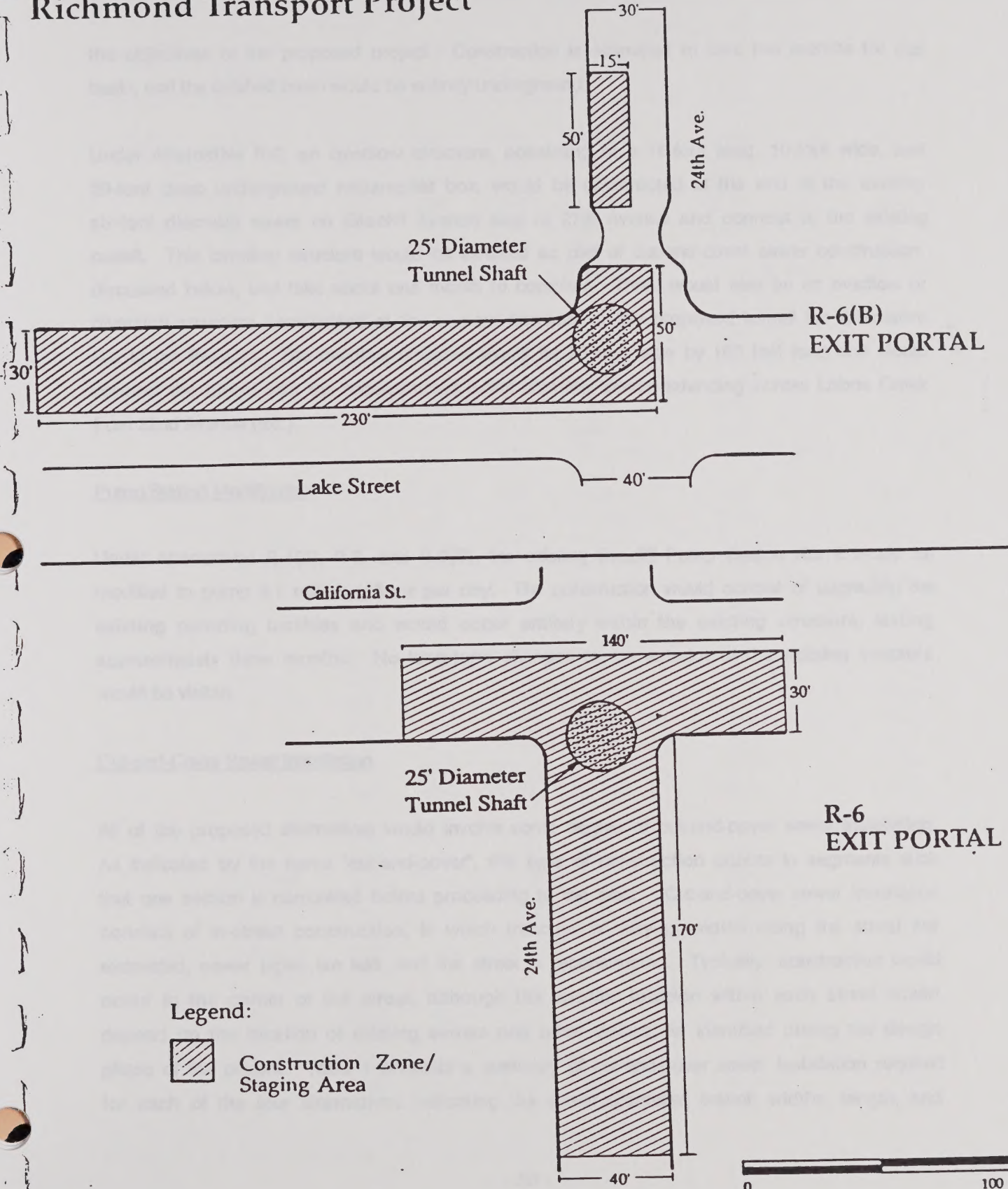


CONSTRUCTION ZONE FOR ALTERNATIVES B-E AND B-6(G) TUNNEL ENTRY PORTAL Richmond Water Project

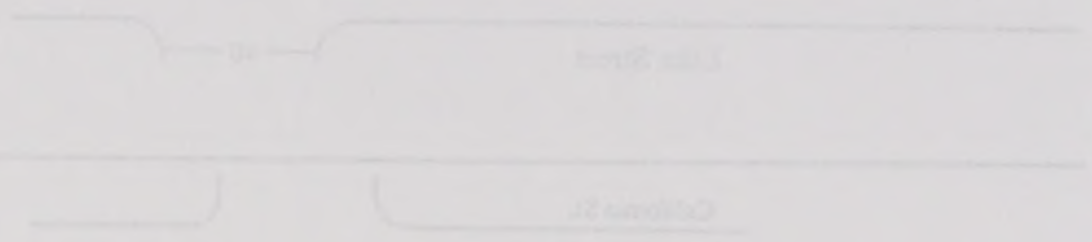


- Legend:
- Construction Zone
 - Shading Area
 - Tunnel Entry Portal

CONSTRUCTION ZONE FOR ALTERNATIVES R-6 AND R-6(B) TUNNEL EXIT PORTALS Richmond Transport Project



CONSTRUCTION ZONE FOR
ALTERNATIVES B-6 AND B-6(B)
TUNNEL EXIT PORTALS
Richmond Transport Project



Legend
Construction Area
Existing Area

the objectives of the proposed project. Construction is estimated to take five months for this basin, and the finished basin would be entirely underground.

Under Alternative R-2, an overflow structure, consisting of a 16-foot long, 10-foot wide, and 20-foot deep underground rectangular box, would be constructed at the end of the existing six-foot diameter sewer on Seacliff Avenue east of 27th Avenue and connect to the existing outfall. This overflow structure would be installed as part of cut-and-cover sewer construction, discussed below, and take about one month to complete. There would also be an overflow or diversion structure constructed at the eastern terminus of the proposed tunnel for Alternative R-2 in the Presidio. The overflow structure would be 20 feet wide by 100 feet long and would connect the tunnel with the reconstructed 5-foot diameter sewer extending across Lobos Creek from 22nd Avenue (ext.).

Pump Station Modification

Under Alternatives R-4(A), R-6, and R-6(B), the existing Seacliff Pump Station No. 2 would be modified to pump 3.1 million gallons per day. The construction would consist of upgrading the existing pumping facilities and would occur entirely within the existing structure, lasting approximately three months. No long-term changes to the exterior of the existing structure would be visible.

Cut-and-Cover Sewer Installation

All of the proposed alternatives would involve some degree of cut-and-cover sewer installation. As indicated by the name "cut-and-cover", this type of construction occurs in segments such that one section is completed before proceeding to the next. Cut-and-cover sewer installation consists of in-street construction, in which trenches of varying widths along the street are excavated, sewer pipes are laid, and the street is reconstructed. Typically, construction would occur in the center of the street, although the specific location within each street would depend on the location of existing sewers and other utilities, as identified during the design phase of the project. Table 1 presents a summary of cut-and-cover sewer installation required for each of the four alternatives indicating the sewer diameter, trench widths, length, and

TABLE 1

SUMMARY OF CUT-AND-COVER SEWER INSTALLATION

Alternative	Sewer Diameter (feet)	Trench Width (feet)	Length (feet)	Depth (feet)	Street Segment		
					Street	From	To
R-2	5.25	9.43	700	15-25	Lincoln	Presidio	25th
	5.0	9.14	220	10-15	Presidio	(north of 22nd)	
	2.5	6.5	1,400	15-20	El Camino	25th	29th
	3.0	7.25	500	7-20	Seacliff	25th	26th
	10.0 (OS)	15.0	16	20	Seacliff	(east of 27th)	
	4.5	8.54	920	10-12	Fulton	43rd	46th
	4.25	8.27	1,800	10-15	Great Hwy.	Anza St. (ext.)	Fulton
R-4(A)	1.5	5.25	500	7-20	Seacliff	25th	26th
	3.0	7.25	200	20-25	Seacliff	26th	27th
	1.0 (FM)	4.2	500	5-10	Scenic	Seacliff	25th
	1.0 (FM)	4.2	900	5-10	25th	Scenic	Lake
	6.0	10.25	900	10-25	Lake	24th	27th
	4.5	8.54	920	10-12	Fulton	43rd	46th
	4.25	8.27	1,800	10-15	Great Hwy.	Anza St. (ext.)	Fulton
R-6	1.5	5.25	500	7-20	Seacliff	25th	26th
	3.0	7.25	200	20-25	Seacliff	26th	27th
	1.0 (FM)	4.2	500	5-10	Scenic	Seacliff	25th
	1.0 (FM)	4.2	900	5-10	25th	Scenic	Lake
	2.25	6.25	900	10-25	Lake	24th	27th
	5.25	9.43	680	9-16	17th	Lake	Calif.
	5.75	10.0	680	29-33	24th	Lake	Calif.
	5.5	9.73	1,550	16-30	Calif.	17th	22nd
	5.75	10.0	620	30-35	Calif.	22nd	24th
	3.0	7.25	930	7-30	Fulton	40th	43rd
	4.5	8.54	310	10-12	Fulton	43rd	44th
	4.75	8.85	310	10-12	Fulton	44th	45th
	5.25	9.43	310	10-12	Fulton	45th	46th
R-6(B)	1.5	5.25	500	7-20	Seacliff	25th	26th
	3.0	7.25	200	20-25	Seacliff	26th	27th
	1.0 (FM)	4.2	500	5-10	Scenic	Seacliff	25th
	1.0 (FM)	4.2	900	5-10	25th	Scenic	Lake
	4.5	8.54	1,550	9-23	Lake	17th	22nd
	4.25	8.27	310	23-26	Lake	22nd	23rd
	4.75	8.85	310	26-29	Lake	23rd	24th
	2.25	6.25	900	10-25	Lake	24th	27th
	3.0	7.25	930	7-30	Fulton	40th	43rd
	4.5	8.54	310	10-12	Fulton	43rd	44th
	4.75	8.85	310	10-12	Fulton	44th	45th
	4.25	8.27	310	10-12	Fulton	45th	46th

Note: OS = Overflow Structure; FM = Force Main

COMPARISON OF THE EFFECTS OF VARIOUS FACTORS ON THE GROWTH OF THE FISH

Factor	Length (mm)	Weight (g)	Survival (%)	Feeding (%)	Reproduction (%)
Temperature	100	100	100	100	100
Food	100	100	100	100	100
Light	100	100	100	100	100
Oxygen	100	100	100	100	100
pH	100	100	100	100	100
Salinity	100	100	100	100	100
Water Quality	100	100	100	100	100
Stocking Density	100	100	100	100	100
Harvesting Time	100	100	100	100	100
Transportation	100	100	100	100	100
Marketing	100	100	100	100	100
Consumer Satisfaction	100	100	100	100	100
Environmental Impact	100	100	100	100	100
Socioeconomic Status	100	100	100	100	100
Government Policy	100	100	100	100	100
International Trade	100	100	100	100	100
Research and Development	100	100	100	100	100
Education and Training	100	100	100	100	100
Health and Safety	100	100	100	100	100
Quality Control	100	100	100	100	100
Customer Service	100	100	100	100	100
Brand Management	100	100	100	100	100
Marketing Strategy	100	100	100	100	100
Distribution Network	100	100	100	100	100
Logistics Management	100	100	100	100	100
Inventory Control	100	100	100	100	100
Accounting and Finance	100	100	100	100	100
Human Resources	100	100	100	100	100
Information Technology	100	100	100	100	100
Legal and Compliance	100	100	100	100	100
Public Relations	100	100	100	100	100
Media and Advertising	100	100	100	100	100
Community Engagement	100	100	100	100	100
Partnerships and Alliances	100	100	100	100	100
Investment and Funding	100	100	100	100	100
Risk Management	100	100	100	100	100
Contingency Planning	100	100	100	100	100
Disaster Preparedness	100	100	100	100	100
Business Continuity	100	100	100	100	100
Performance Evaluation	100	100	100	100	100
Continuous Improvement	100	100	100	100	100
Strategic Planning	100	100	100	100	100
Business Development	100	100	100	100	100
Market Research	100	100	100	100	100
Competitor Analysis	100	100	100	100	100
Customer Segmentation	100	100	100	100	100
Target Marketing	100	100	100	100	100
Product Development	100	100	100	100	100
Service Innovation	100	100	100	100	100
Process Improvement	100	100	100	100	100
Automation and Robotics	100	100	100	100	100
Artificial Intelligence	100	100	100	100	100
Big Data Analytics	100	100	100	100	100
Cloud Computing	100	100	100	100	100
Mobile Applications	100	100	100	100	100
Wearable Devices	100	100	100	100	100
Internet of Things	100	100	100	100	100
Blockchain Technology	100	100	100	100	100
Cryptocurrency	100	100	100	100	100
Virtual Reality	100	100	100	100	100
Augmented Reality	100	100	100	100	100
3D Printing	100	100	100	100	100
Drone Technology	100	100	100	100	100
Autonomous Vehicles	100	100	100	100	100
Robotics Process Automation	100	100	100	100	100
Artificial Neural Networks	100	100	100	100	100
Machine Learning	100	100	100	100	100
Deep Learning	100	100	100	100	100
Reinforcement Learning	100	100	100	100	100
Generative Adversarial Networks	100	100	100	100	100
Transfer Learning	100	100	100	100	100
Meta-Learning	100	100	100	100	100
Federated Learning	100	100	100	100	100
Swarm Intelligence	100	100	100	100	100
Evolutionary Algorithms	100	100	100	100	100
Genetic Algorithms	100	100	100	100	100
Particle Swarm Optimization	100	100	100	100	100
Ant Colony Optimization	100	100	100	100	100
Tabu Search	100	100	100	100	100
Simulated Annealing	100	100	100	100	100
Genetic Programming	100	100	100	100	100
Neural Network Pruning	100	100	100	100	100
Quantum Computing	100	100	100	100	100
Quantum Cryptography	100	100	100	100	100
Quantum Machine Learning	100	100	100	100	100
Quantum Simulation	100	100	100	100	100
Quantum Communication	100	100	100	100	100
Quantum Sensing	100	100	100	100	100
Quantum Imaging	100	100	100	100	100
Quantum Metrology	100	100	100	100	100
Quantum Optics	100	100	100	100	100
Quantum Information Theory	100	100	100	100	100
Quantum Complexity Theory	100	100	100	100	100
Quantum Game Theory	100	100	100	100	100
Quantum Cryptography	100	100	100	100	100
Quantum Key Distribution	100	100	100	100	100
Quantum Secure Communication	100	100	100	100	100
Quantum Random Number Generation	100	100	100	100	100
Quantum Entanglement	100	100	100	100	100
Quantum Superposition	100	100	100	100	100
Quantum Tunneling	100	100	100	100	100
Quantum Interference	100	100	100	100	100
Quantum Coherence	100	100	100	100	100
Quantum Decoherence	100	100	100	100	100
Quantum Measurement	100	100	100	100	100
Quantum State Tomography	100	100	100	100	100
Quantum Process Tomography	100	100	100	100	100
Quantum Channel Characterization	100	100	100	100	100
Quantum Error Correction	100	100	100	100	100
Quantum Fault Tolerance	100	100	100	100	100
Quantum Scalability	100	100	100	100	100
Quantum Interconnectivity	100	100	100	100	100
Quantum Network Architecture	100	100	100	100	100
Quantum Network Protocols	100	100	100	100	100
Quantum Network Security	100	100	100	100	100
Quantum Network Management	100	100	100	100	100
Quantum Network Optimization	100	100	100	100	100
Quantum Network Performance	100	100	100	100	100
Quantum Network Reliability	100	100	100	100	100
Quantum Network Availability	100	100	100	100	100
Quantum Network Flexibility	100	100	100	100	100
Quantum Network Scalability	100	100	100	100	100
Quantum Network Interoperability	100	100	100	100	100
Quantum Network Compatibility	100	100	100	100	100
Quantum Network Portability	100	100	100	100	100
Quantum Network Transferability	100	100	100	100	100
Quantum Network Reconfigurability	100	100	100	100	100
Quantum Network Adaptability	100	100	100	100	100
Quantum Network Resilience	100	100	100	100	100
Quantum Network Robustness	100	100	100	100	100
Quantum Network Durability	100	100	100	100	100
Quantum Network Longevity	100	100	100	100	100
Quantum Network Sustainability	100	100	100	100	100
Quantum Network Viability	100	100	100	100	100
Quantum Network Feasibility	100	100	100	100	100
Quantum Network Practicality	100	100	100	100	100
Quantum Network Usability	100	100	100	100	100
Quantum Network Accessibility	100	100	100	100	100
Quantum Network Inclusion	100	100	100	100	100
Quantum Network Exclusion	100	100	100	100	100
Quantum Network Segregation	100	100	100	100	100
Quantum Network Integration	100	100	100	100	100
Quantum Network Interconnection	100	100	100	100	100
Quantum Network Interoperability	100	100	100	100	100
Quantum Network Compatibility	100	100	100	100	100
Quantum Network Portability	100	100	100	100	100
Quantum Network Transferability	100	100	100	100	100
Quantum Network Reconfigurability	100	100	100	100	100
Quantum Network Adaptability	100	100	100	100	100
Quantum Network Resilience	100	100	100	100	100
Quantum Network Robustness	100	100	100	100	100
Quantum Network Durability	100	100	100	100	100
Quantum Network Longevity	100	100	100	100	100
Quantum Network Sustainability	100	100	100	100	100
Quantum Network Viability	100	100	100	100	100
Quantum Network Feasibility	100	100	100	100	100
Quantum Network Practicality	100	100	100	100	100
Quantum Network Usability	100	100	100	100	100
Quantum Network Accessibility	100	100	100	100	100
Quantum Network Inclusion	100	100	100	100	100
Quantum Network Exclusion	100	100	100	100	100
Quantum Network Segregation	100	100	100	100	100
Quantum Network Integration	100	100	100	100	100
Quantum Network Interconnection	100	100	100	100	100
Quantum Network Interoperability	100	100	100	100	100
Quantum Network Compatibility	100	100	100	100	100
Quantum Network Portability	100	100	100	100	100
Quantum Network Transferability	100	100	100	100	100
Quantum Network Reconfigurability	100	100	100	100	100
Quantum Network Adaptability	100	100	100	100	100
Quantum Network Resilience	100	100	100	100	100
Quantum Network Robustness	100	100	100	100	100
Quantum Network Durability	100	100	100	100	100
Quantum Network Longevity	100	100	100	100	100
Quantum Network Sustainability	100	100	100	100	100
Quantum Network Viability	100	100	100	100	100
Quantum Network Feasibility	100	100	100	100	100
Quantum Network Practicality	100	100	100	100	100
Quantum Network Usability	100	100	100	100	100
Quantum Network Accessibility	100	100	100	100	100
Quantum Network Inclusion	100	100	100	100	100
Quantum Network Exclusion	100	100	100	100	100
Quantum Network Segregation	100	100	100	100	100
Quantum Network Integration	100	100	100	100	100
Quantum Network Interconnection	100	100	100	100	100
Quantum Network Interoperability	100	100	100	100	100
Quantum Network Compatibility	100	100	100	100	100
Quantum Network Portability	100	100	100	100	100
Quantum Network Transferability	100	100	100	100	100
Quantum Network Reconfigurability	100	100	100	100	100
Quantum Network Adaptability	100	100	100	100	100
Quantum Network Resilience	100	100	100	100	100
Quantum Network Robustness	100	100	100	100	100
Quantum Network Durability	100	100	100	100	100
Quantum Network Longevity	100	100	100	100	100
Quantum Network Sustainability	100	100	100	100	100
Quantum Network Viability	100	100	100	100	100
Quantum Network Feasibility	100	100	100	100	100
Quantum Network Practicality	100	100	100	100	100
Quantum Network Usability	100	100	100	100	100
Quantum Network Accessibility	100	100	100	100	100
Quantum Network Inclusion	100	100	100	100	100
Quantum Network Exclusion	100	100	100	100	100
Quantum Network Segregation	100	100	100	100	100
Quantum Network Integration	100	100	100	100	100
Quantum Network Interconnection	100	100	100	100	100
Quantum Network Interoperability	100	100	100	100	100
Quantum Network Compatibility	100	100	100	100	100
Quantum Network Portability	100	100	100	100	100
Quantum Network Transferability	100	100	100	100	100
Quantum Network Reconfigurability	100	100	100	100	100
Quantum Network Adaptability	100	100	100	100	100
Quantum Network Resilience	100	100	100	100	100
Quantum Network Robustness	100	100	100	100	100
Quantum Network Durability	100	100	100	100	100
Quantum Network Longevity	100	100	100	100	100
Quantum Network Sustainability	100	100	100	100	100
Quantum Network Viability	100	100	100	100	100
Quantum Network Feasibility	100	100	100	100	100
Quantum Network Practicality	100	100	100	100	100
Quantum Network Usability	100	100	100	100	100
Quantum Network Accessibility	100	100	100	100</	

depth of sewer pipes.⁸ The sewer pipes would range in size from 1.0 to 7.5 feet in diameter and would either flow by gravity (gravity sewers) or under pressure (force main).

For this project, construction would generally proceed block-by-block with a maximum construction zone about 500 feet long and typically about 100 feet of trench exposed at a time.⁹ The construction zone would be occupied by construction crews, equipment, supplies, vehicles, etc. Within the construction zone, there would be staggered operations including excavation, bracing, pipe laying, and backfilling. Any trenching or excavation typically needs to have sidewall reinforcement (such as sheetpiles), which would be installed either with a front-end loader, water jet, or pile driver. Sonic or vibratory pile drivers would be used wherever soil conditions permit, and impact tools, such as pile drivers, would only be used if soil is encountered that could not be accommodated by other equipment.

The typical schedule for installation of a street sewer would start with excavation of the trench. Following excavation of the trench, some type of bracing (such as metal shields or sheet piles) is installed and a subgrade material is laid. The sewer pipe is then placed in the trench, and the bracing is removed after the trench is backfilled. This operation typically proceeds at a rate of 20 feet per day for pipes 5 feet in diameter and greater and 25 linear feet per day for pipes less than 5 feet in diameter or about 4 to 5 days per 100-foot segment. The schedule would be extended by 2 to 3 days if it is a trench deeper than 20 feet, if a manhole is required along the segment, or if problems are encountered with making sewer connections or with utility lines.¹⁰

For trenches less than 20 feet deep, access to driveways along the construction route would be blocked for 2 to 3 days during the excavation and pipe laying; for trenches greater than 20 feet deep, driveways would be blocked for 4 to 5 days due to the installation of additional

⁸Personal communication with Peter Cheng, Engineer, Richmond Transport Project, Clean Water Program, December 1988.

⁹Telephone communication with Sara Pickus, Project Manager, Richmond Transport Project, Clean Water Program, April 1989.

¹⁰Telephone communication with Peter Cheng, Project Engineer, Richmond Transport Project, Clean Water Program, April 1989.

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bracing needed for the deeper trench. Manholes would be required about every 300 feet along the pipeline, and an additional 2 to 3 days would be needed for installation. Once the pipe is laid and the trench is backfilled, the access to the driveways would be resumed. When the piping and backfilling for an entire block is completed, the contractors would then repave the block (and possibly block driveways again for one day) and proceed to the next segment.

The areas of street disruption associated with tunnel portals for each alternative are estimated to be as follows:

<u>Alternative</u>	<u>Area of Street Disruption at Portal Staging Areas</u>
R-1	Not applicable (no tunnel)
R-2	10,000 square feet (portal variation 2)
R-4(A)	25,075 square feet (includes portal variation 2 at Great Highway)
R-6	25,875 square feet
R-6(B)	23,675 square feet

There would be additional street disruption associated with cut-and-cover construction. Table 1, page 37, and Table 24, page 195 of the EIR, present the approximate extent of street construction for each alternative. Based on these tables, the total linear feet of in-street construction for each alternative would be as follows:

<u>Alternative</u>	<u>Linear Feet of In-street Construction</u>
R-1	5,776 feet
R-2	5,336 feet (excludes 220 feet in the Presidio)
R-4(A)	5,720 feet
R-6	8,390 feet
R-6(B)	7,030 feet

The square footage of street disruption associated with cut-and-cover construction for each alternative cannot be determined, since the width of the construction zone would vary and is currently unknown.

Haul Routes

Specific haul routes would be designated at the time of construction, as it would be the contractor's discretion whether to sell or dispose of the excavation spoils and would depend on the market at the time of construction. However, it has been determined that if sands are excavated and the material meets the specifications of the Golden Gate National Recreation Area, they would be disposed of at Ocean Beach. At this stage of planning, only general haul routes have been identified. Excavation activities requiring hauling would occur at the tunnel entry portal (either at the Great Highway or on Fulton Street, depending on the alternative) and at the Seacliff storage basin.

For the tunnel excavation, the spoil materials unacceptable for beach disposal could either be hauled north, south, or east. If the contractor selects a disposal site to the north, the trucks would travel south along the Great Highway to Fulton Street, east on Fulton Street to Park Presidio, and then to the Golden Gate Bridge and points north. If the contractor selects a disposal site to the south or east, the trucks would travel south on the Great Highway to Skyline Boulevard and then to Interstate 280. From there, the truck would continue south to Daly City and points south, or to Highway 101 to the Bay Bridge and points east.

For excavation at the Seacliff storage basin, the haul route for disposal sites to the north would be from 25th Avenue to El Camino del Mar to Lincoln Boulevard to the Golden Gate Bridge. The haul route for disposal sites to the south or east would be from 25th Avenue to Geary Boulevard east and crosstown to the appropriate freeway. If sands are excavated, they would be hauled along 25th Avenue to Geary Boulevard west to Ocean Beach.

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Along the cut-and-cover routes, the excavated material would remain at the site for backfill, and hauling of spoils would be negligible (about one truck load per week). Trucking would be required primarily for equipment delivery, and Geary Boulevard would be designated as the major truck route, with vehicle use of the closest cross street to the construction site and Geary Boulevard.¹¹

PROJECT SCHEDULE AND COST

The proposed schedule¹² for all four of the alternatives for the Richmond Transport Project is anticipated to be as follows:

Planning/Environmental Review	Present to June 1990	•
Board of Supervisors' Decision on Project	Summer 1990	•
Design	Summer 1990 to November 1991	•
Construction	Fall 1992 to Fall 1994	•
Operation	Fall 1994	

The estimated costs for each alternative is presented in Table 2.

¹¹Telephone communication with Li Boccia, Contract Manager, Richmond Transport Project, Clean Water Program, March 1989.

¹²Letter from Robert T. Cockburn, Executive Director, Clean Water Program, to Steven Ritchie, Executive Officer, Regional Water Quality Control Board, and to Harry Seraydarian, Director, Waste Management Division, U.S. Environmental Protection Agency, dated November 10, 1988.

TABLE 2

ESTIMATED CONSTRUCTION COST OF PROJECT ALTERNATIVES

Alternative	Cost ¹ (in million dollars)
R-2	\$ 31.44 ²
R-4(A)	34.28 ²
R-6	31.04
R-6(B)	31.54

¹Includes contingency and inspection costs.

²Does not include Right-of-Way costs.

Source: Clean Water Program, 1989.

PROJECT APPROVALS AND PLANNING CONSIDERATIONS

The roles of planning and regulatory agencies which may have permit or funding authority over the proposed project are summarized below. Table 3 summarizes the reviewing agencies for each alternative.

U.S. Environmental Protection Agency (EPA). The EPA maintains a program for funding, monitoring, and establishment of compliance for state and local pollution control programs. The federal program and funding for the Richmond Transport Project would be implemented through the California State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Board, San Francisco Bay Region (RWQCB).

U.S. Army at the Presidio. Any portion of the Richmond Transport Project requiring construction on or beneath land in the Presidio (Alternative R-2) is subject to approval by the U.S. Army, including any necessary environmental review and granting of required easements (See discussion on pages 52 to 54).

TABLE 3*

**PLANNING AND REGULATORY AGENCIES
AFFECTING PROJECT ALTERNATIVES**

Agency	Alternative				
	R-1	R-2	R-4(A)	R-6	R-6(B)
U.S. Environmental Protection Agency	X	X	X	X	X
U.S. Army, Presidio	X	X			
U.S. Army Corps of Engineers		X			
Golden Gate National Recreation Area	X	X	X		
U.S. Fish and Wildlife		X			
Veterans Administration		X	X		
Advisory Council on Historic Preservation	X	X			
State Water Resources Control Board	X	X	X	X	X
California Department of Fish & Game		X			
State Department of Parks and Recreation	X	X	X		
Regional Water Quality Control Board	X	X	X	X	X
Coastal Commission	X	X	X	X	
Bay Area Air Quality Management District	X	X	X	X	X
San Francisco Clean Water Program	X	X	X	X	X
San Francisco City Planning Commission	X	X	X	X	X
San Francisco Board of Supervisors	X	X	X	X	X
San Francisco Recreation and Park Commission	X	X	X	X	X

Note: X indicates planning and/or regulatory role.

TABLE 2.1

PLANNED AND UNPLANNED SUBJECTS
IN THE HISTORY OF RESEARCH

Study	Design			
	Pre-Test	Post-Test	Control	Group
U.S. Government National Survey	X			
U.S. Army Study	X			
U.S. Navy Study	X			
U.S. Army Study (1950s)	X			
U.S. Navy Study (1950s)	X			
U.S. Army Study (1960s)	X			
U.S. Navy Study (1960s)	X			
U.S. Army Study (1970s)	X			
U.S. Navy Study (1970s)	X			
U.S. Army Study (1980s)	X			
U.S. Navy Study (1980s)	X			
U.S. Army Study (1990s)	X			
U.S. Navy Study (1990s)	X			
U.S. Army Study (2000s)	X			
U.S. Navy Study (2000s)	X			
U.S. Army Study (2010s)	X			
U.S. Navy Study (2010s)	X			
U.S. Army Study (2020s)	X			
U.S. Navy Study (2020s)	X			
U.S. Army Study (2030s)	X			
U.S. Navy Study (2030s)	X			
U.S. Army Study (2040s)	X			
U.S. Navy Study (2040s)	X			
U.S. Army Study (2050s)	X			
U.S. Navy Study (2050s)	X			
U.S. Army Study (2060s)	X			
U.S. Navy Study (2060s)	X			
U.S. Army Study (2070s)	X			
U.S. Navy Study (2070s)	X			
U.S. Army Study (2080s)	X			
U.S. Navy Study (2080s)	X			
U.S. Army Study (2090s)	X			
U.S. Navy Study (2090s)	X			
U.S. Army Study (2100s)	X			
U.S. Navy Study (2100s)	X			

Note: X indicates presence of design element.

U.S. Army Corps of Engineers. The Corps of Engineers may have jurisdiction over the construction associated with the proposed sewer line crossing Lobos Creek (Alternative R-2) subject to provisions of Section 404 of the Clean Water Act.

Golden Gate National Recreation Area (GGNRA). Any long-term planning on the Presidio is subject to approval by the GGNRA, which is part of the U. S. Department of Interior, National Park Service. The GGNRA has jurisdiction over any new construction and development in the Presidio (see discussion on pages 52 to 54). Approval by GGNRA is required for tunneling beneath Fort Miley, Lands End, and Sutro Heights Park. The GGNRA also has jurisdiction over the waterfront from Baker Beach south to the Daly City boundary, including Sutro Heights Park, and must grant approval for beach disposal of excavated sand. The GGNRA has stipulated that any spoils that are suitable for beach nourishment should be disposed of on Ocean Beach.

U.S. Fish and Wildlife Service/California Department of Fish and Game. If the apparent best alternative has the potential for affecting sensitive taxa (possibly associated with the Lobos Creek area for Alternative R-2), the U.S. Fish and Wildlife Service and/or the California Department of Fish and Game would have reviewing authority over recommended mitigation measures.

Veterans Administration. The Veterans Administration owns the land at Fort Miley and the Veterans Administration Medical Center, and any projects on or beneath their land [Alternatives R-2 and R-4(A)] would require their approval and granting of required easements.

Advisory Council on Historic Preservation. Any construction of proposed projects within the Presidio (Alternative R-2) is subject to review by this agency.

State Water Resources Control Board/Regional Water Quality Control Board. The State Water Resources Control Board (SWRCB) has purview over grants and loans for construction projects. The Regional Water Quality Control Board (RWQCB) through the SWRCB is the enforcement agency for the federal and state laws regulating allowable discharges of pollutants to receiving waters. The City and County of San Francisco is under order from the RWQCB to reduce the number of times per year when stormwater combined with untreated sewage overflows from the City's sewerage system into the

The State Water Board (SWB) is the primary agency responsible for the management of the State's water resources. The SWB is composed of representatives from various state agencies, including the Department of Water Resources, the Department of Fish and Game, and the Department of Transportation. The SWB is responsible for the development and implementation of the State's water policy, the allocation of water rights, and the regulation of water use.

The SWB is also responsible for the development and implementation of the State's water conservation program. This program is designed to encourage the efficient use of water and to reduce water waste. The SWB is responsible for the development and implementation of the State's water conservation program, the allocation of water rights, and the regulation of water use. The SWB is also responsible for the development and implementation of the State's water conservation program, the allocation of water rights, and the regulation of water use.

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Pacific Ocean and the San Francisco Bay. In the project area, the average annual number of these overflow occurrences should be reduced from 40 to 8.

The SWRCB regulates the water quality of the Pacific Ocean for use and enjoyment by the people of the state as set forth in 'California Ocean Plan' (1988, with draft amendments July, 1989). The Richmond Transport Project would affect discharges (i.e., wastewater overflows) to the ocean and is therefore subject to the California Ocean Plan. By reducing the number of overflows to the ocean, the project would improve the water quality of the ocean, thereby protecting beneficial uses. Hence, the project would appear to be consistent with the Ocean Plan, although it is not up to the San Francisco City Planning Commission to make such a determination.

Although not specifically listed, Lobos Creek would be subject to the 'Water Quality Control Plan for the San Francisco Bay Basin,' administered by the RWQCB, which provides water quality objectives and guidelines for protecting the beneficial uses of surface waters in the region. Under Alternative R-2, the project would involve construction in the vicinity of Lobos Creek, but assuming implementation of specified mitigation measures, the project would have no effect on Lobos Creek water quality; the beneficial uses of the creek would therefore be maintained. Hence, the project would appear to be consistent with the Basin Plan, although it is not up to the San Francisco City Planning Commission to make such a determination.

State Department of Parks and Recreation. The State Department of Parks and Recreation, Office of Historic Preservation, has reviewing authority over any project (Alternative R-2) within the Presidio, which is a designated historic site. In addition, review of mitigation measures for any cultural resources potentially affected by the apparent best alternative would be required by this agency.

State Coastal Commission. The Coastal Commission has approval authority for Clean Water Projects within their jurisdiction, which includes the Great Highway and Sutro Heights Parks (associated with Alternatives R-2 and R-4).

Bay Area Air Quality Management District. The Bay Area Air Quality Management District requires permits for construction and operation of all pumping and storage facilities and any other facilities that

could pose long-term air quality impacts, including odor. The current permit for the existing Seacliff Pump Station No. 2 would need to be modified if the capacity of this station is enlarged as proposed under Alternatives R-4(A), R-6, and R-6(B).

City and County of San Francisco. Various agencies and departments under the City's jurisdiction are responsible for planning and implementing the Wastewater Management Master Plan, including the Richmond Transport Project. The Clean Water Program, under the Department of Public Works, is responsible for overall planning, design, and construction of the proposed project.

The Department of City Planning is responsible for environmental review of the proposed project, as required by the California Environmental Quality Act. The City's Planning Commission would need to certify the EIR and to determine whether the project conforms to the City's Master Plan. Approval by the City's Board of Supervisors is required for the project itself, for any environmental documentation associated with the project, and for appropriation of project funds.

Other City agencies that would be involved in the Richmond Transport Project include the Recreation and Park Commission, which has jurisdiction over Lincoln Park, the Great Highway, and Golden Gate Park; any construction for portions of the project occurring on or beneath these areas [such as Alternatives R-2, R-4(A), R-6, and R-6(B)] would require approval by this commission.

which are not subject to public review. The design team for the project is required to submit a design report to the Department of Transportation (DOT) and the Wisconsin Department of Natural Resources (WDNR) for review and approval.

The design team is required to submit a design report to the DOT and the WDNR for review and approval. The design report should include a description of the project, a list of the design team members, a list of the design team's responsibilities, a list of the design team's findings, and a list of the design team's recommendations.

The Department of Transportation (DOT) is responsible for reviewing the design report and for approving the design team's findings and recommendations. The DOT may also require the design team to submit additional information or to revise the design report.

Other DOT agencies may also be involved in the design process. For example, the Wisconsin Department of Natural Resources (WDNR) may be involved in the design of the project's environmental impact statement.

Birds Identified in the Lobos Creek Area

Allen's Hummingbird
American Goldfinch
American Kestrel
American Robin
Anna's Hummingbird
Barn Swallow
Black Phoebe
Black-throated Blue Warbler
Brewer's Blackbird
Brown-headed Cowbird
Brown Towhee
Bushtit
California Quail
Cedar Waxwing
Chestnut-backed Chickadee
Common Raven
Cooper's Hawk
Dark-eyed Junco
European Starling
Fox Sparrow
Golden-crowned Sparrow
Hermit Thrush
House Finch
Killdeer
Mallard
Mourning Dove
Northern Flicker
Orange-crowned Warbler
Pine Siskin
Purple Finch
Pygmy Nuthatch
Red-breasted Nuthatch
Red-shouldered Hawk
Red-tailed Hawk
Rock Dove
Ruby-crowned Kinglet
Rufous-sided Towhee
Scrub Jay
Song Sparrow
Townsend's Warbler
Varied Thrush
Western Flycatcher
White-crowned Sparrow
Yellow-rumped Warbler

from: U.S. Army Corps of Engineers 1988 Field Notes

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